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Mckenzie et al.

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(45) **Date of Patent: Jun. 18, 2019**

(54) **TECHNIQUES FOR ANIMATING STICKERS WITH SOUND**

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(51) **Int. Cl.**

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G06T 13/80	(2011.01)
H04N 21/439	(2011.01)
H04N 21/482	(2011.01)

(52) **U.S. Cl.**

CPC ***G06T 13/205*** (2013.01); ***G06T 13/80*** (2013.01); *H04N 21/439* (2013.01); *H04N 21/482* (2013.01)

(58) **Field of Classification Search**

CPC ... G06T 13/205; G06T 13/80; H04M 1/72544

See application file for complete search history.

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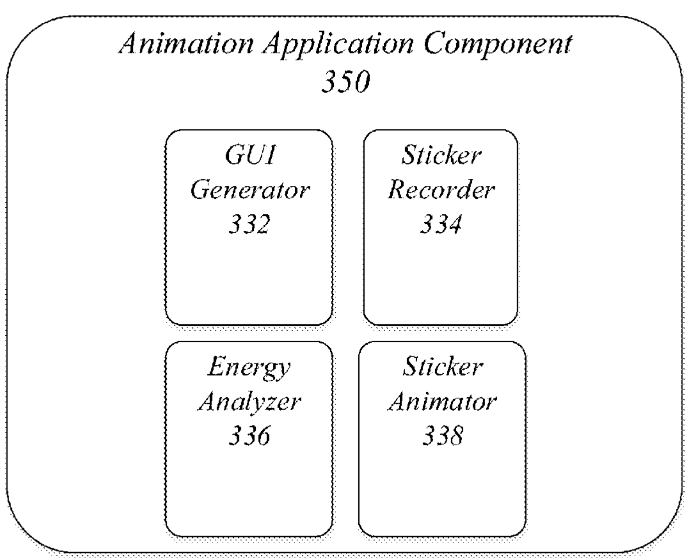
Primary Examiner — Daniel F Hajnik

(57) **ABSTRACT**

Techniques for animating stickers with sound include receiving audio input by a first mobile device; animating a selected image according to an energy level of the audio input using a set of animation frames associated with the selected image in a user interface view of an application executing on the first mobile device; and presenting the animated image concurrently with receiving the audio input. Other embodiments are described and claimed.

20 Claims, 20 Drawing Sheets

Animated Messaging System 100



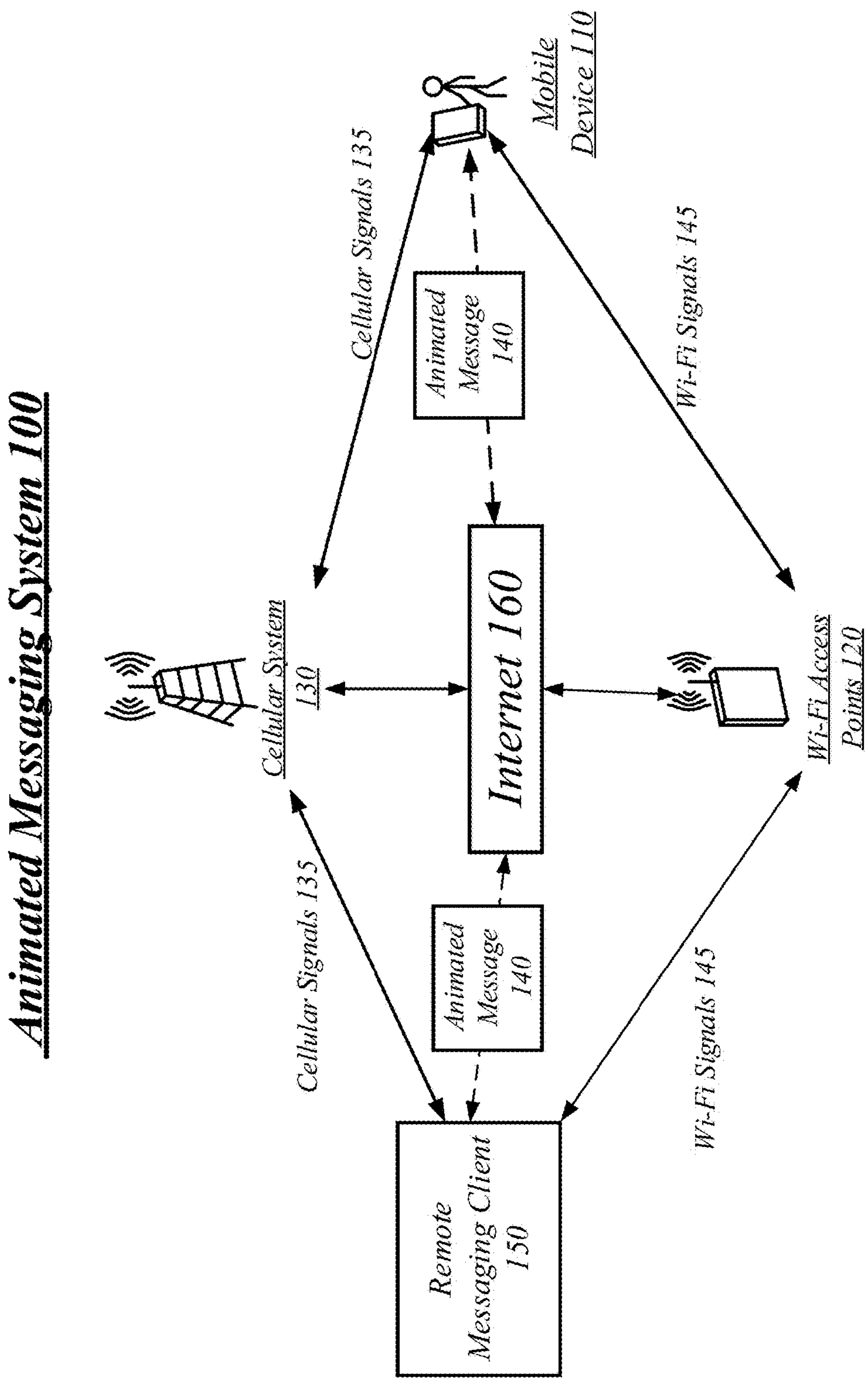

Animated Messaging System 100
Mobile Device 110
Cellular Signals 135
Animated Message 140
Wi-Fi Signals 145
Cellular System 130
Internet 160
Wi-Fi Access Points 120
Cellular Signals 135
Animated Message 140
Wi-Fi Signals 145
Remote Messaging Client 150

FIG. 1

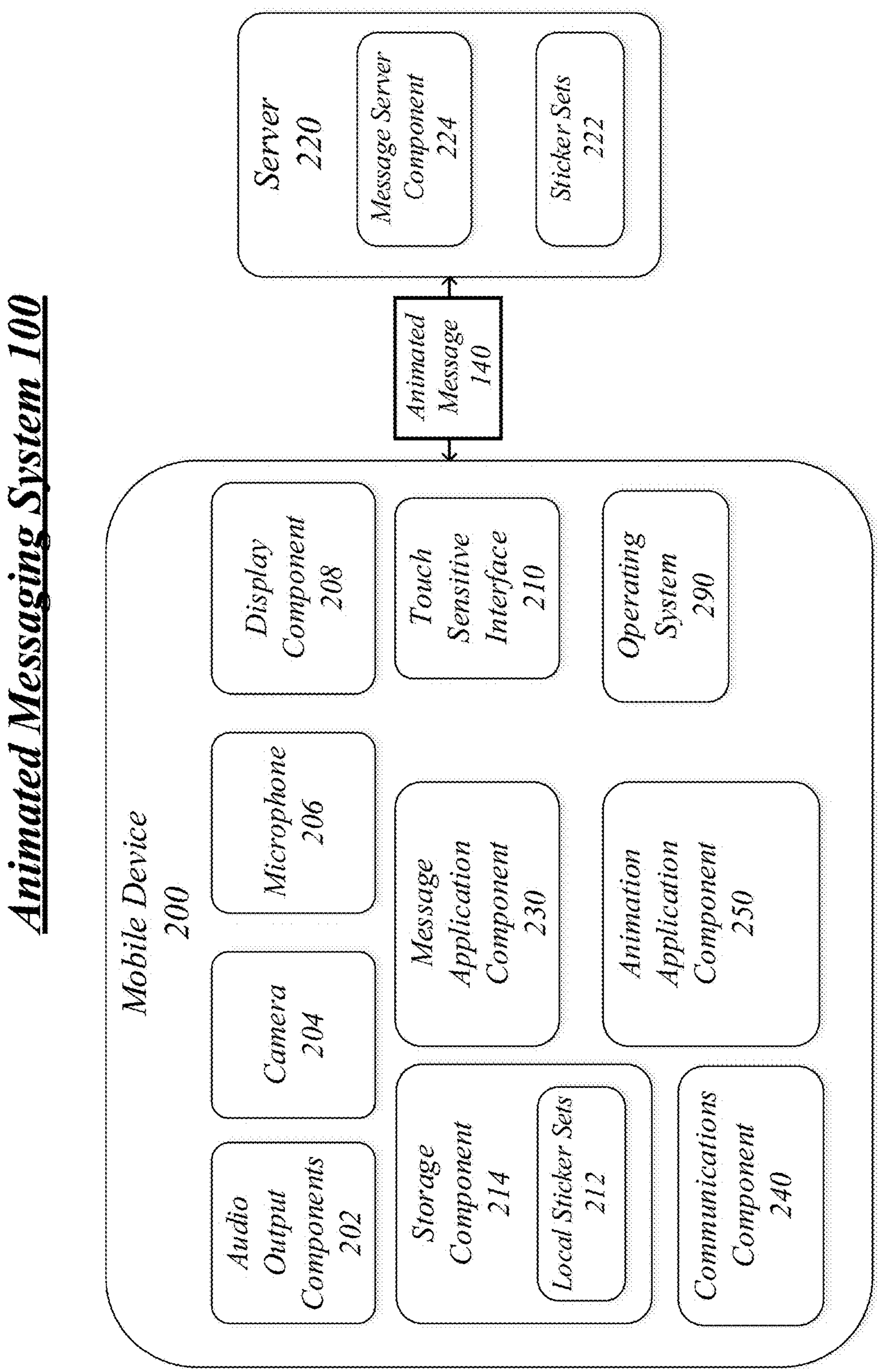

Animated Messaging System 100
Server 220
Message Server Component 224
Sticker Sets 222
Animated Message 140
Mobile Device 200
Audio Output Components 202
Camera 204
Microphone 206
Display Component 208
Storage Component 214
Local Sticker Sets 212
Message Application Component 230
Touch Sensitive Interface 210
Communications Component 240
Animation Application Component 250
Operating System 290

FIG. 2

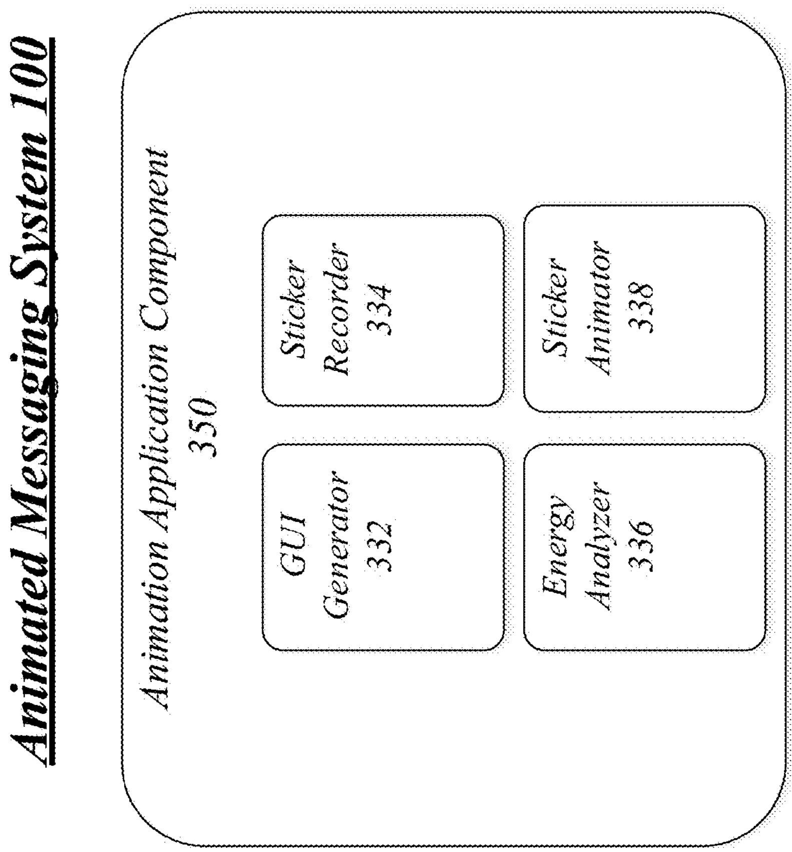

Animated Messaging System 100
Animation Application Component 350
GUI Generator 332
Sticker Recorder 334
Energy Analyzer 336
Sticker Animator 338

FIG. 3

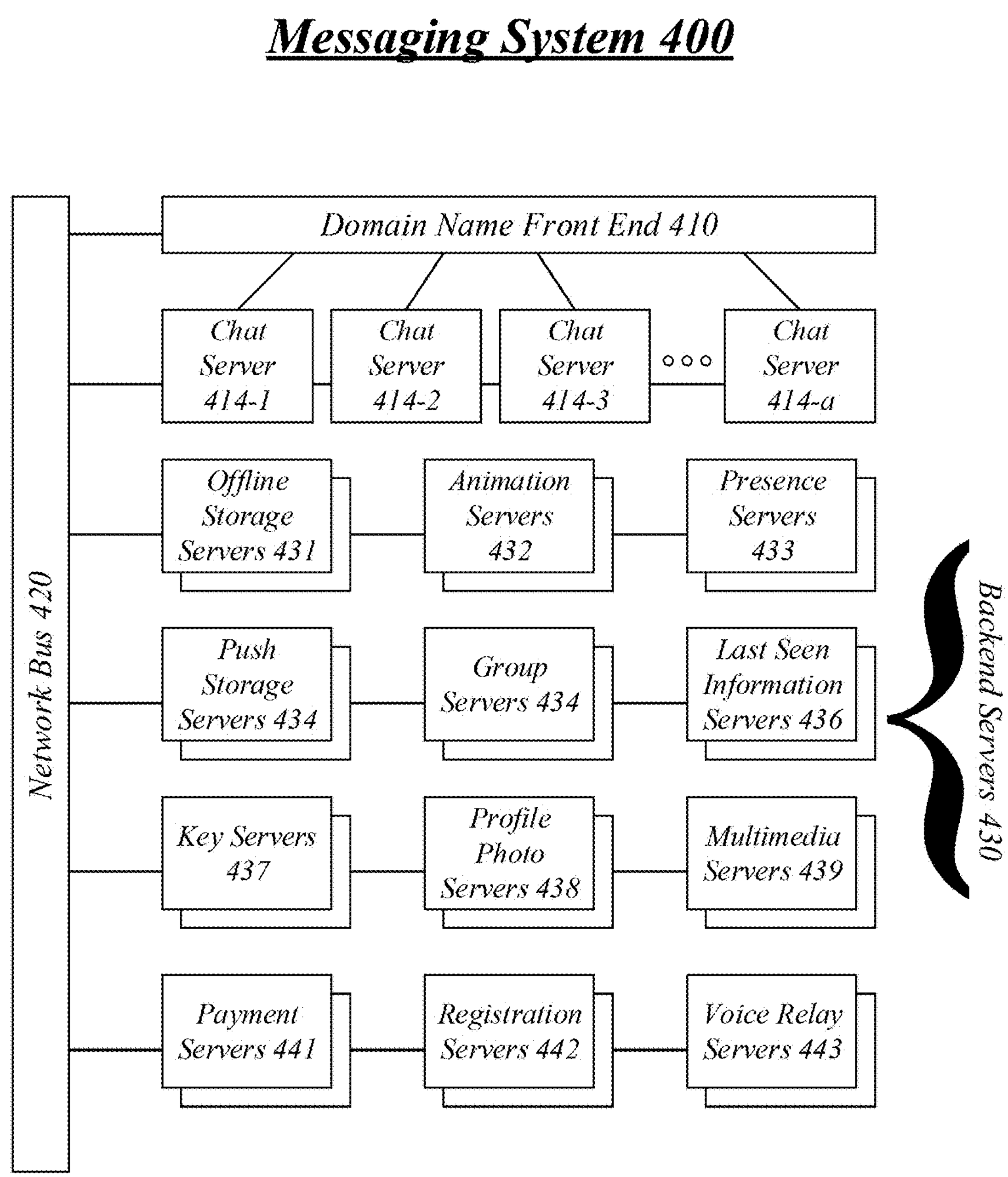

Messaging System 400
Domain Name Front End 410
Chat Server 414-1
Chat Server 414-2
Chat Server 414-3
Chat Server 414-a
Offline Storage Servers 431
Animation Servers 432
Presence Servers 433
Push Storage Servers 434
Group Servers 434
Last Seen Information Servers 436
Key Servers 437
Profile Photo Servers 438
Multimedia Servers 439
Payment Servers 441
Registration Servers 442
Voice Relay Servers 443
Network Bus 420
Backend Servers 430

FIG. 4

Set of Animation Frames 500

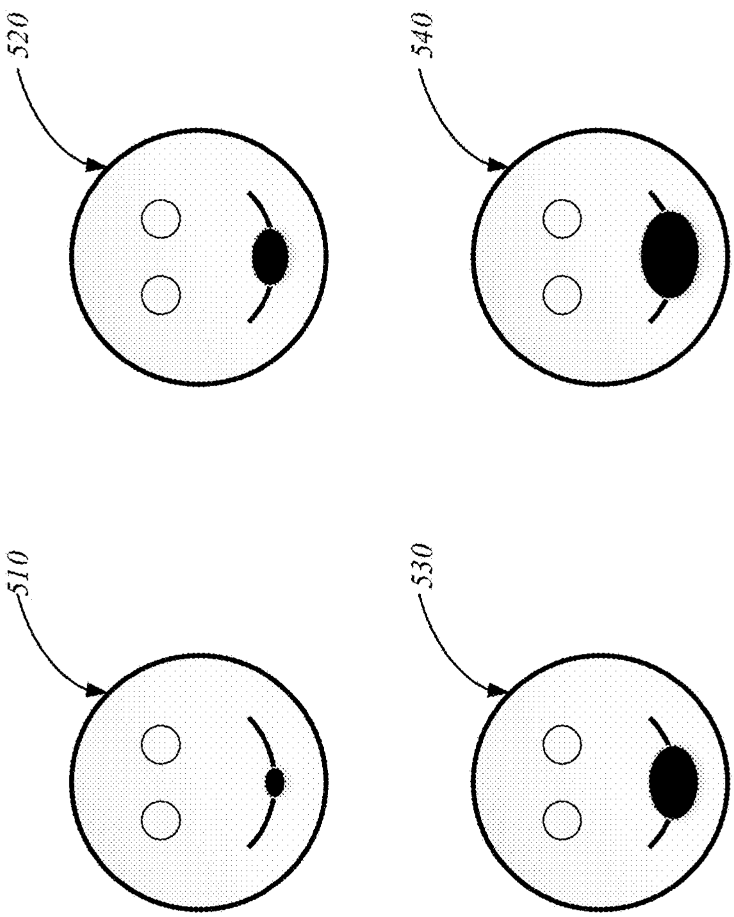


FIG. 5

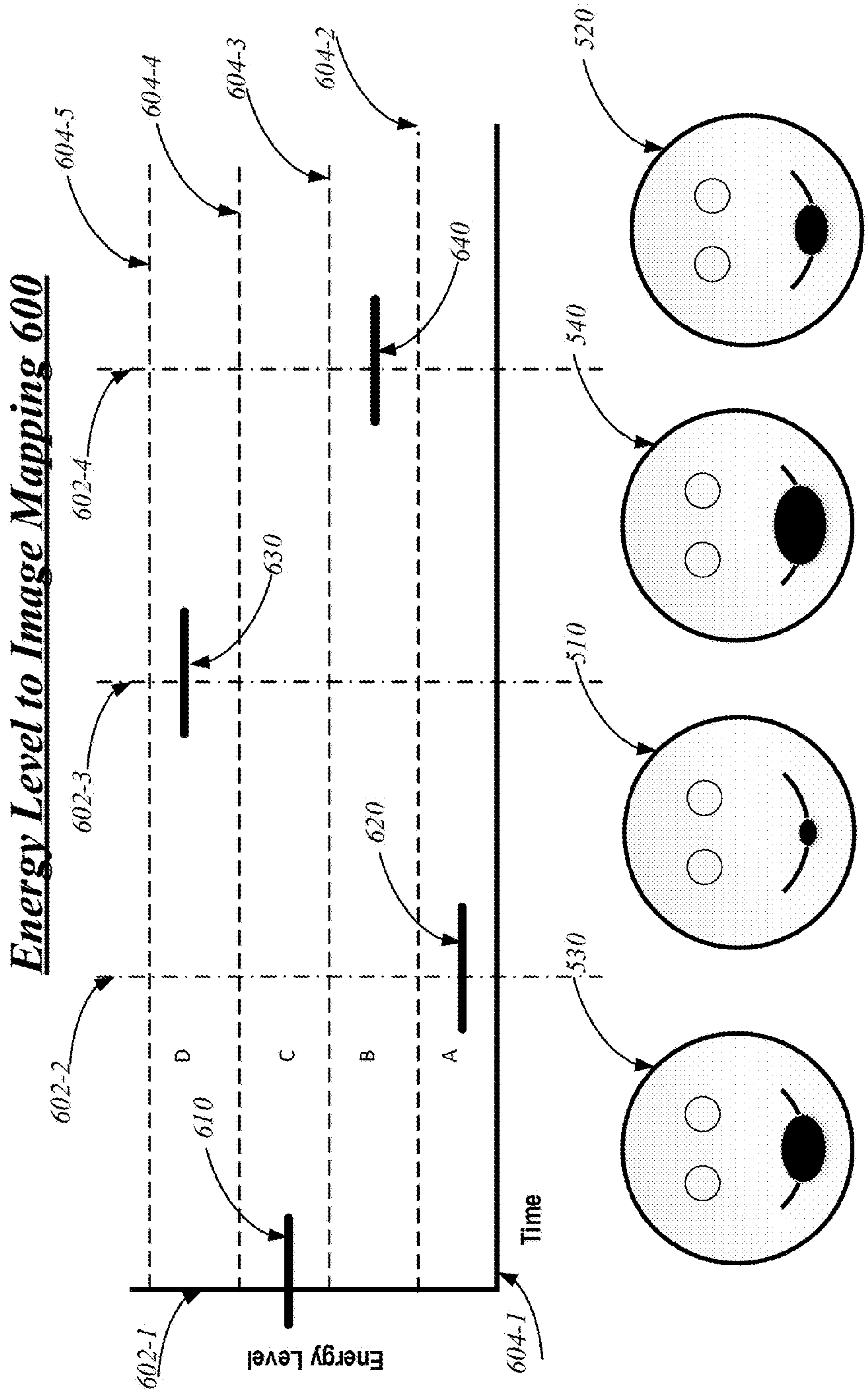

Energy Level to Image Mapping 600
Energy Level
Time
A
B
C
D
602-1
602-2
602-3
602-4
604-1
604-2
604-3
604-4
604-5
610
620
630
640
510
520
530
540

FIG. 6

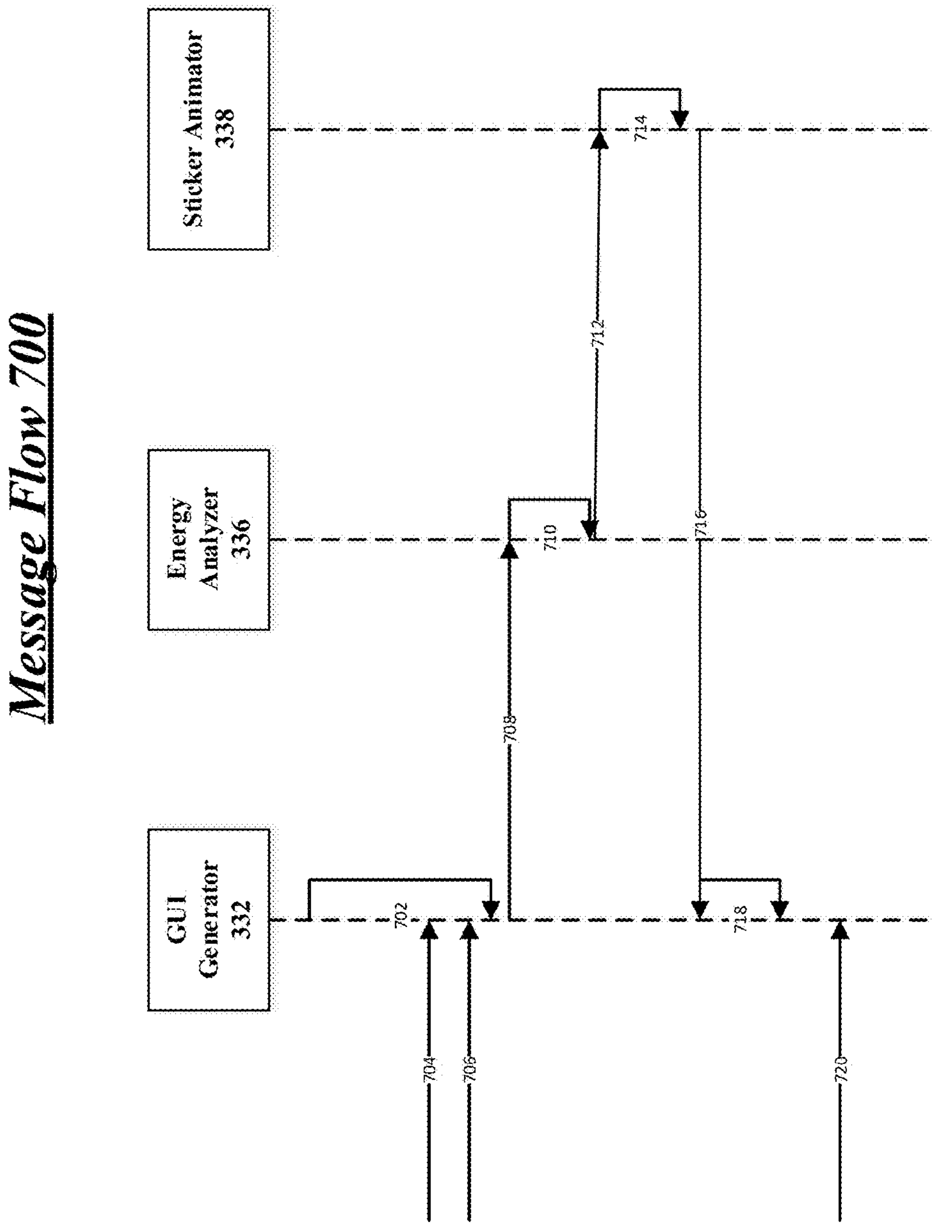

Message Flow 700
GUI Generator 332
Energy Analyzer 336
Sticker Animator 338
702
704
706
708
710
712
714
716
718
720

FIG. 7

Message Flow 800

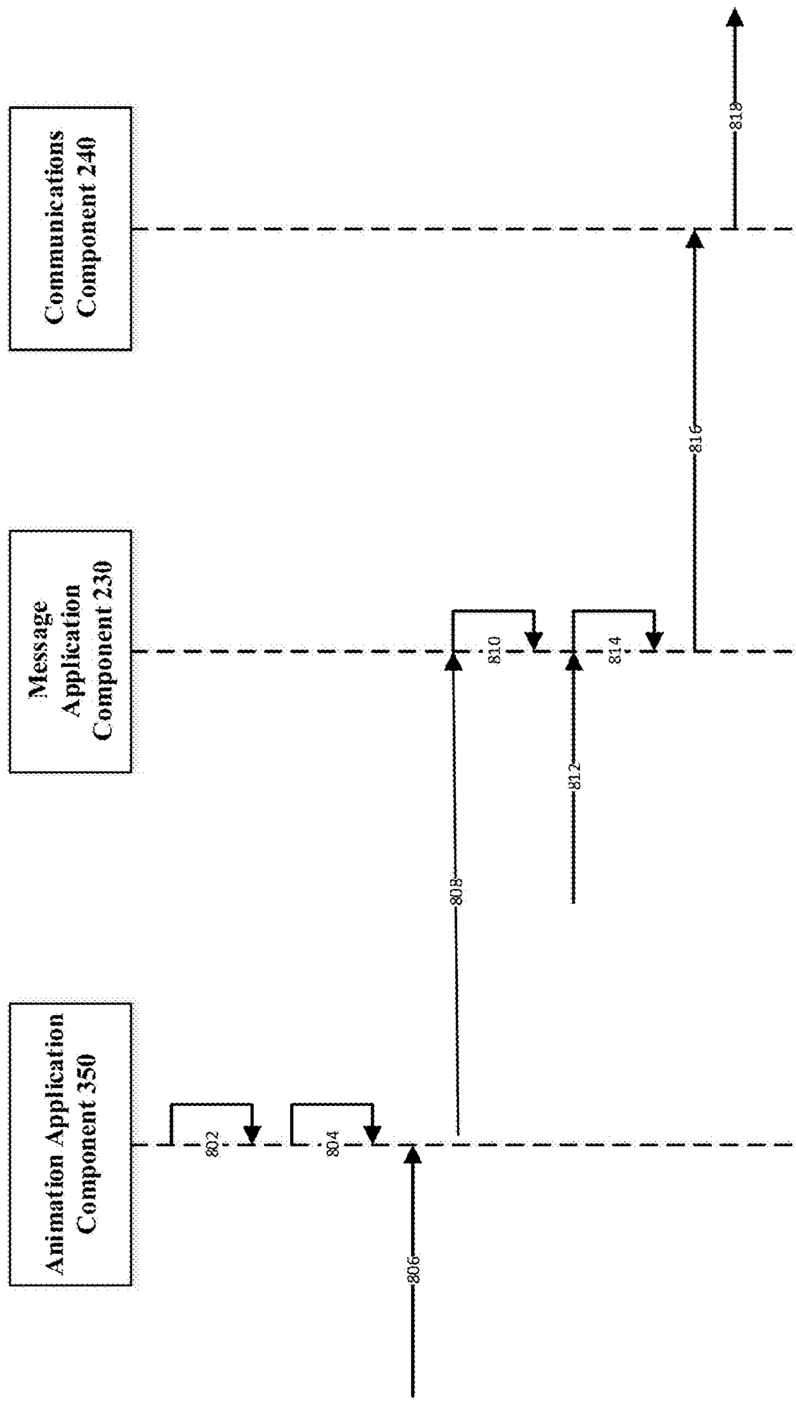


FIG. 8

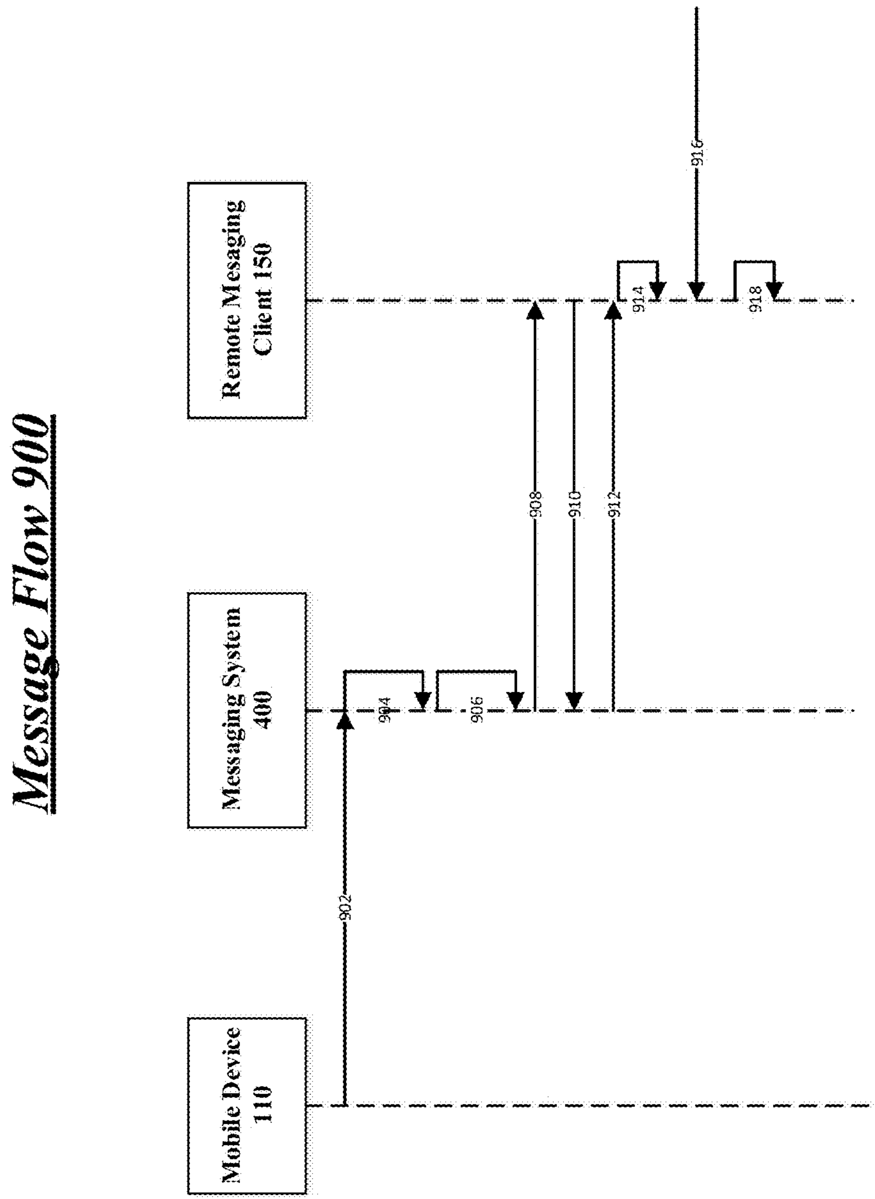

Message Flow 900
Mobile Device 110
Messaging System 400
Remote Mesaging Client 150
902
904
906
908
910
912
914
916
918

FIG. 9

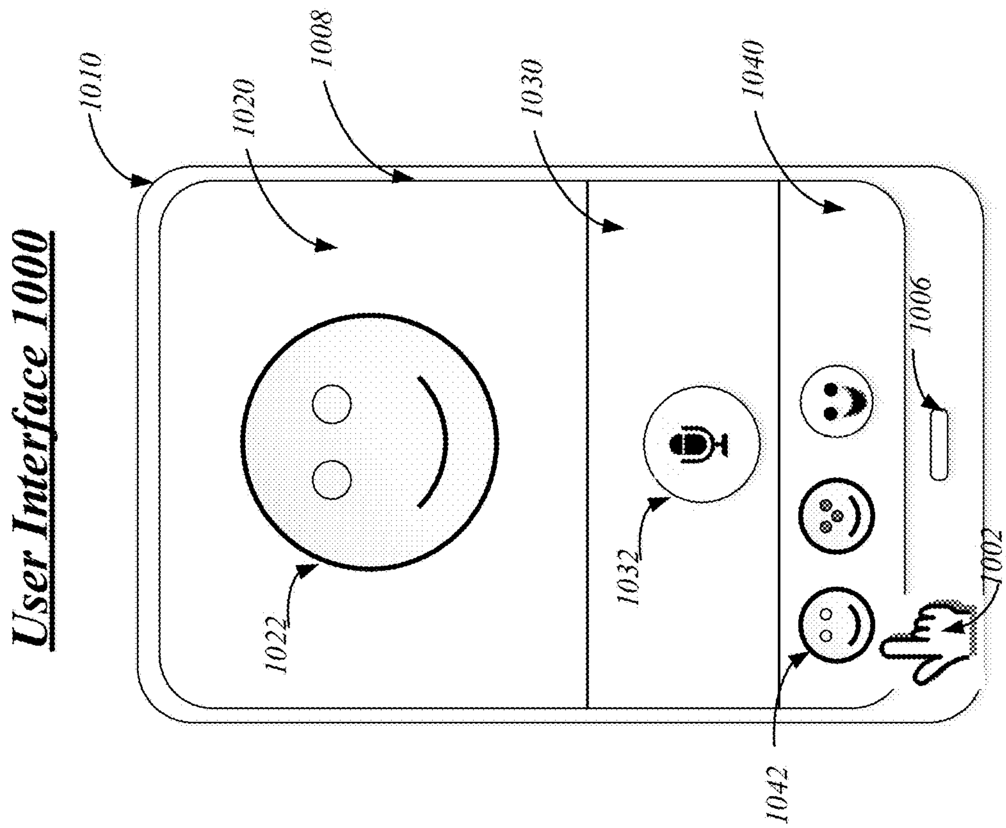

User Interface 1000
1010
1020
1008
1030
1040
1006
1022
1032
1002
1042

FIG. 10

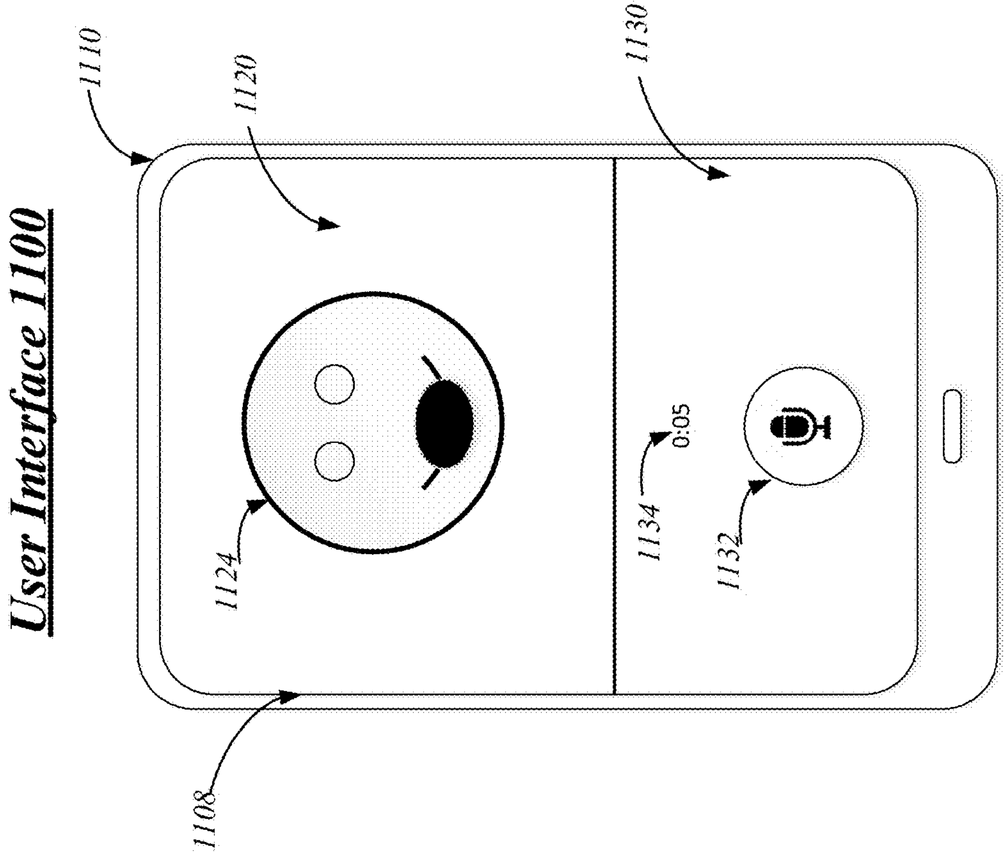


FIG. 11

User Interface 1200

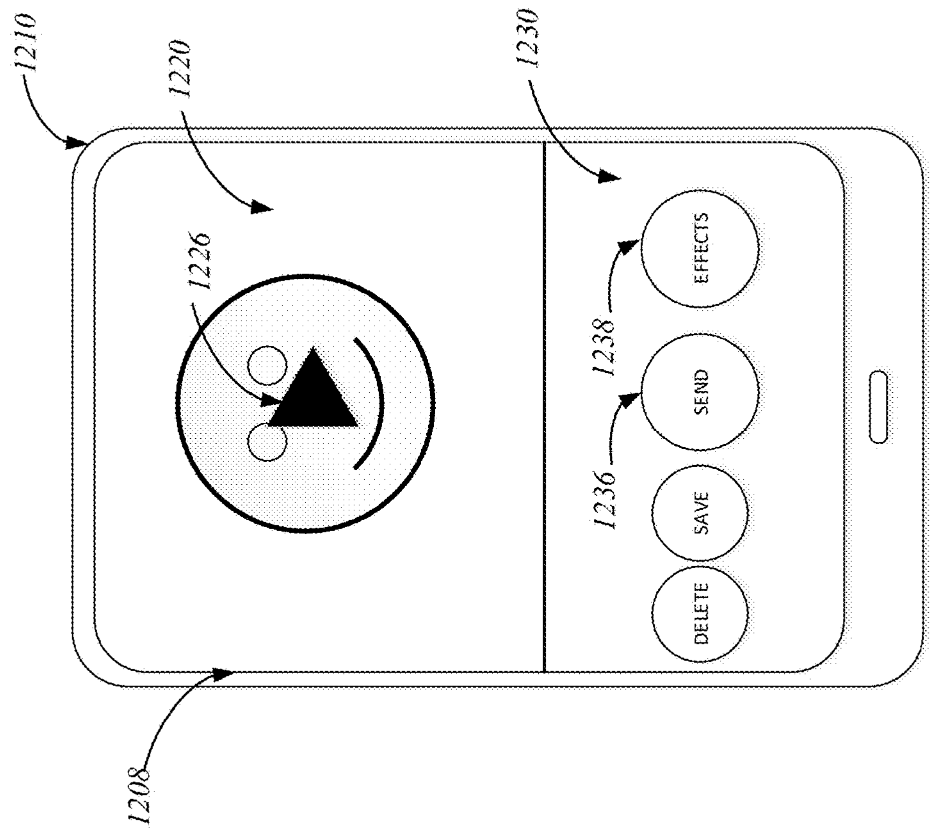


FIG. 12

User Interface 1300

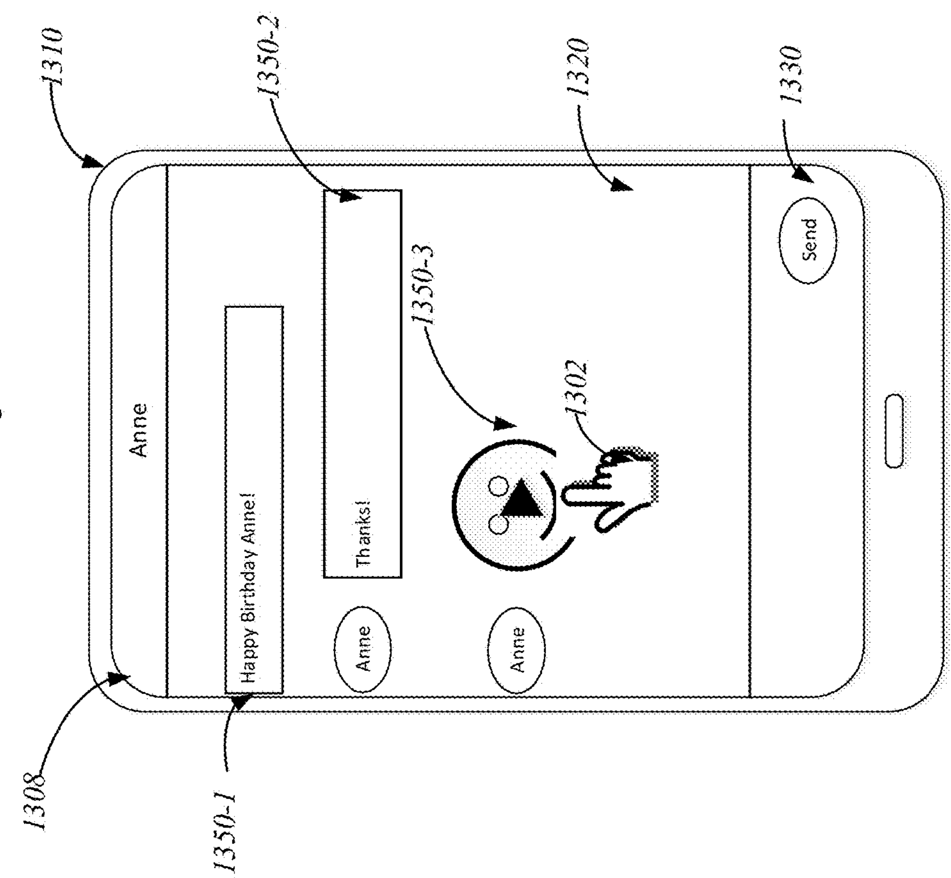


FIG. 13

Centralized System 1400

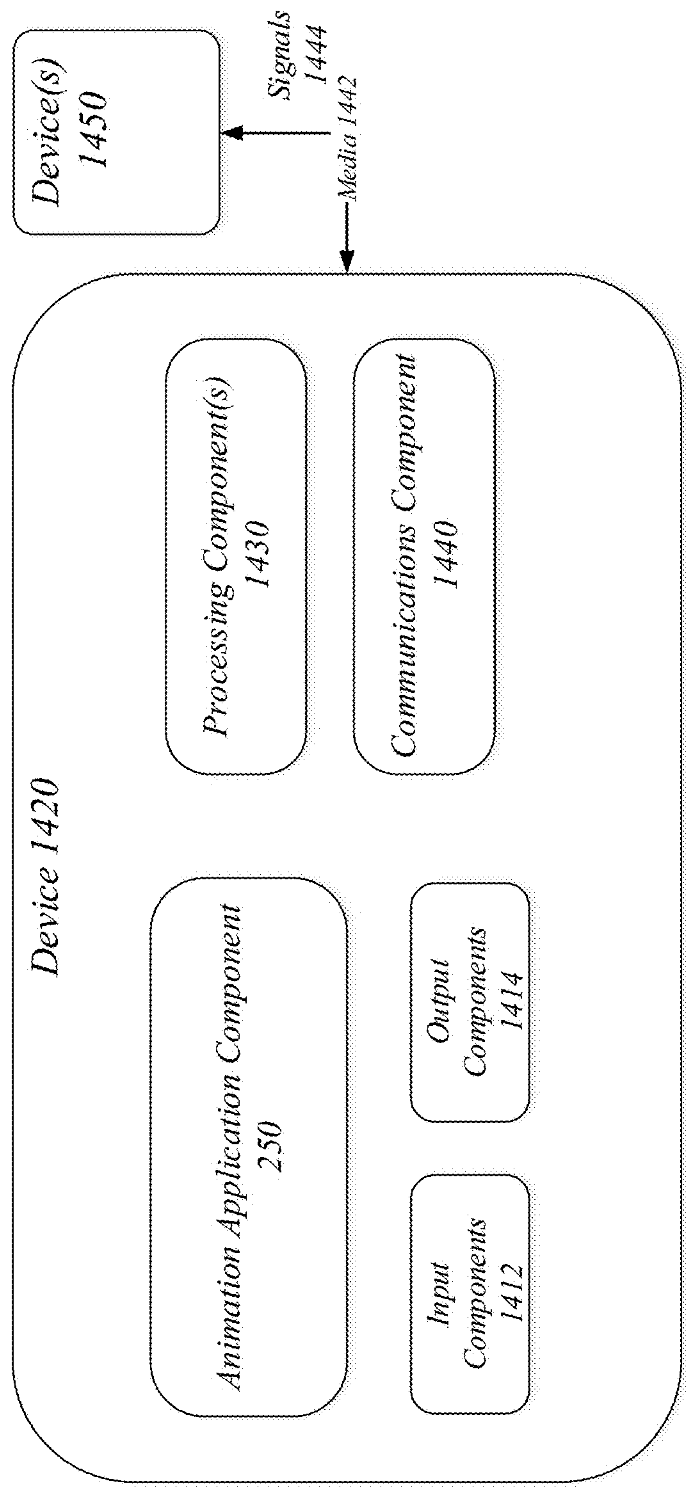


FIG. 14

Distributed System 1500

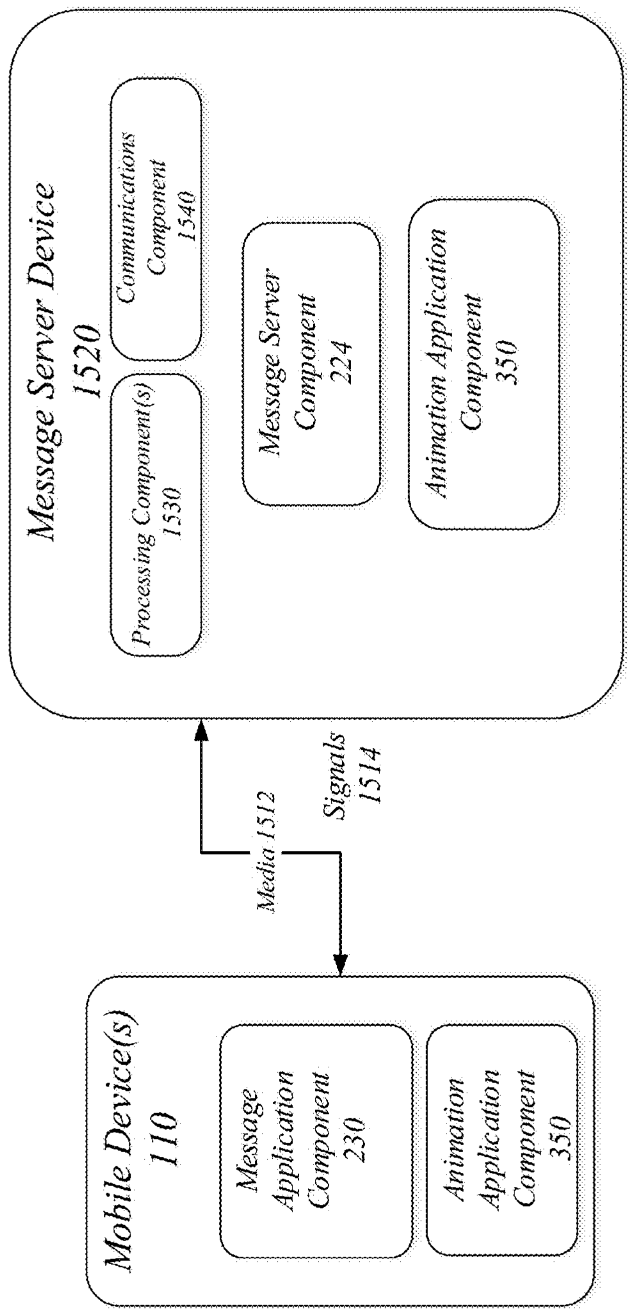


FIG. 15

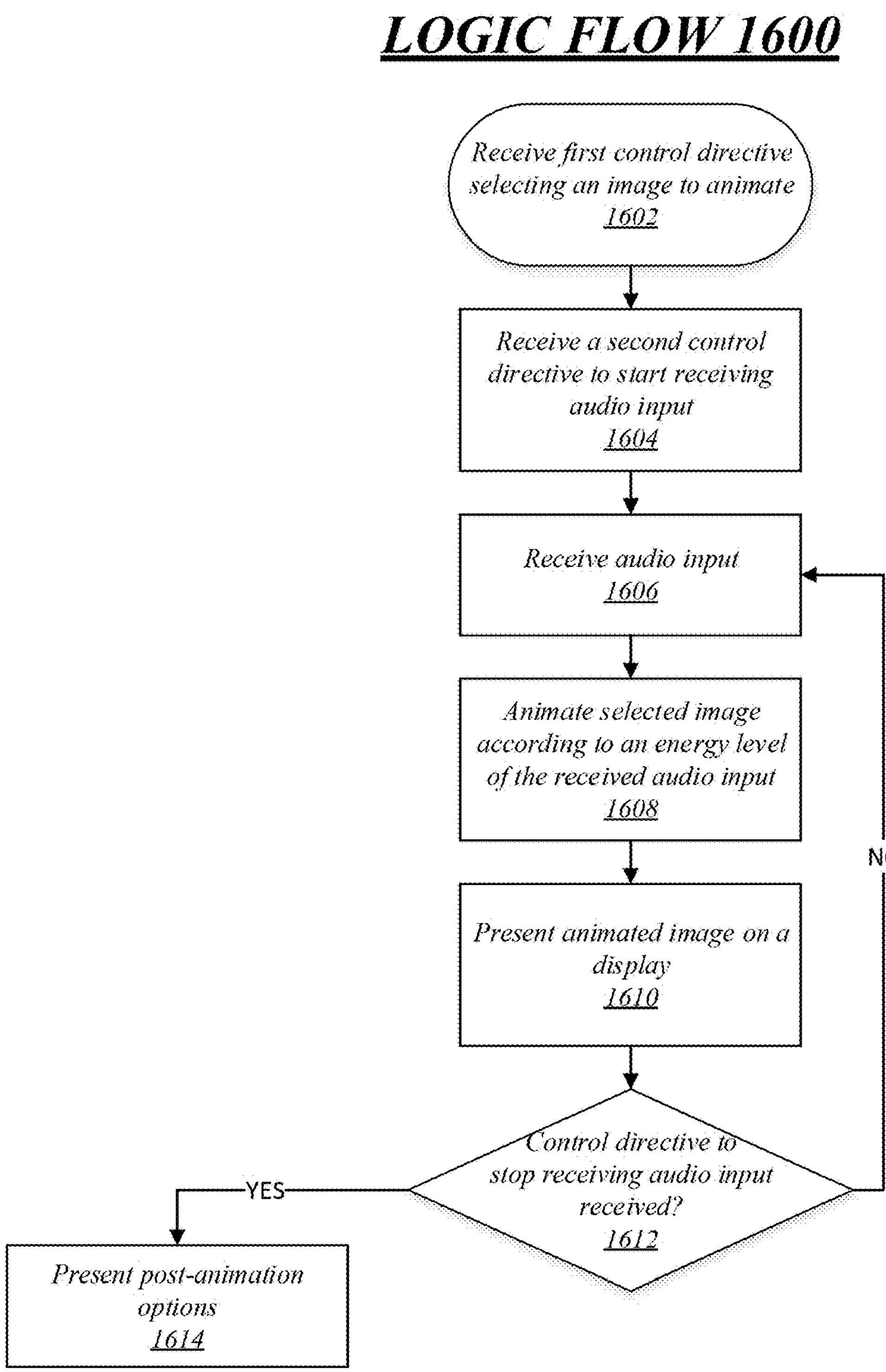

LOGIC FLOW 1600
Receive first control directive selecting an image to animate 1602
Receive a second control directive to start receiving audio input 1604
Receive audio input 1606
Animate selected image according to an energy level of the received audio input 1608
Present animated image on a display 1610
Control directive to stop receiving audio input received? 1612
YES
NO
Present post-animation options 1614

FIG. 16

LOGIC FLOW 1700

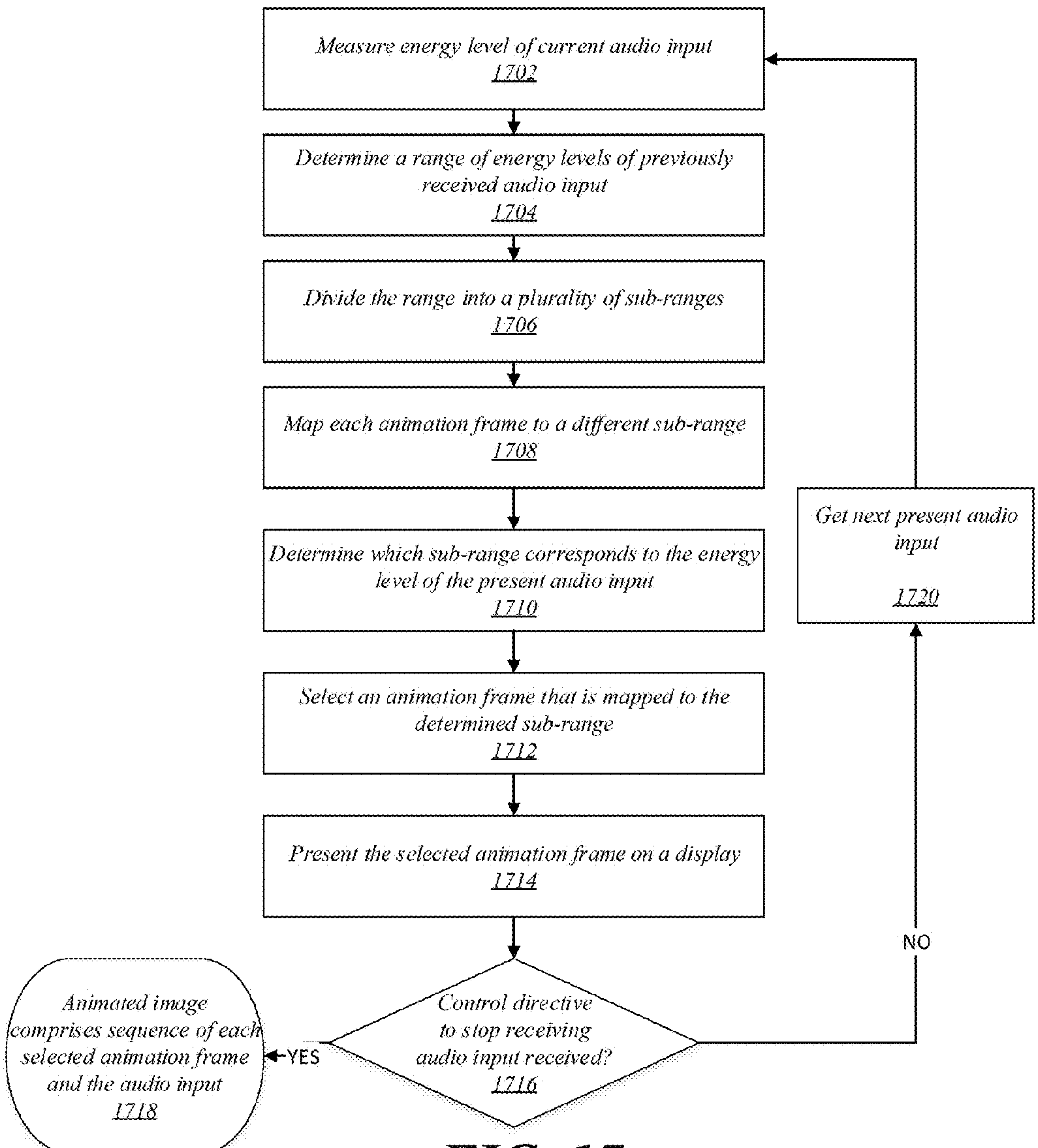


FIG. 17

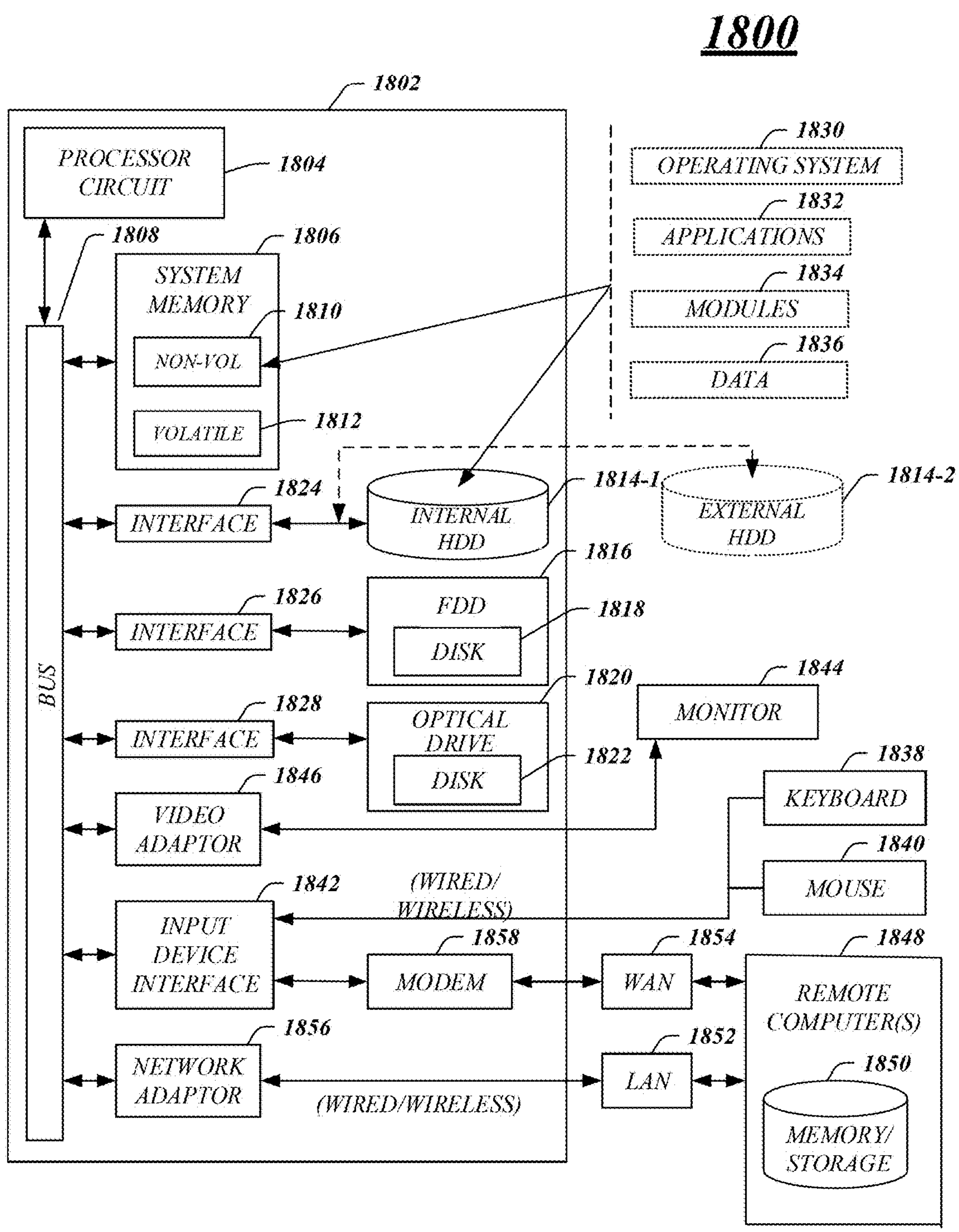

1800
1802
PROCESSOR CIRCUIT
1804
1808
1806
SYSTEM MEMORY
1810
NON-VOL
VOLATILE
1812
BUS
1824
INTERFACE
INTERNAL HDD
1814-1
EXTERNAL HDD
1814-2
1816
1826
INTERFACE
FDD
DISK
1818
1828
INTERFACE
1820
OPTICAL DRIVE
DISK
1822
1846
VIDEO ADAPTOR
1842
INPUT DEVICE INTERFACE
(WIRED/ WIRELESS)
1858
MODEM
1856
NETWORK ADAPTOR
(WIRED/WIRELESS)
1830
OPERATING SYSTEM
1832
APPLICATIONS
1834
MODULES
1836
DATA
1844
MONITOR
1838
KEYBOARD
1840
MOUSE
1854
WAN
1852
LAN
1848
REMOTE COMPUTER(S)
1850
MEMORY/ STORAGE

FIG. 18

1900

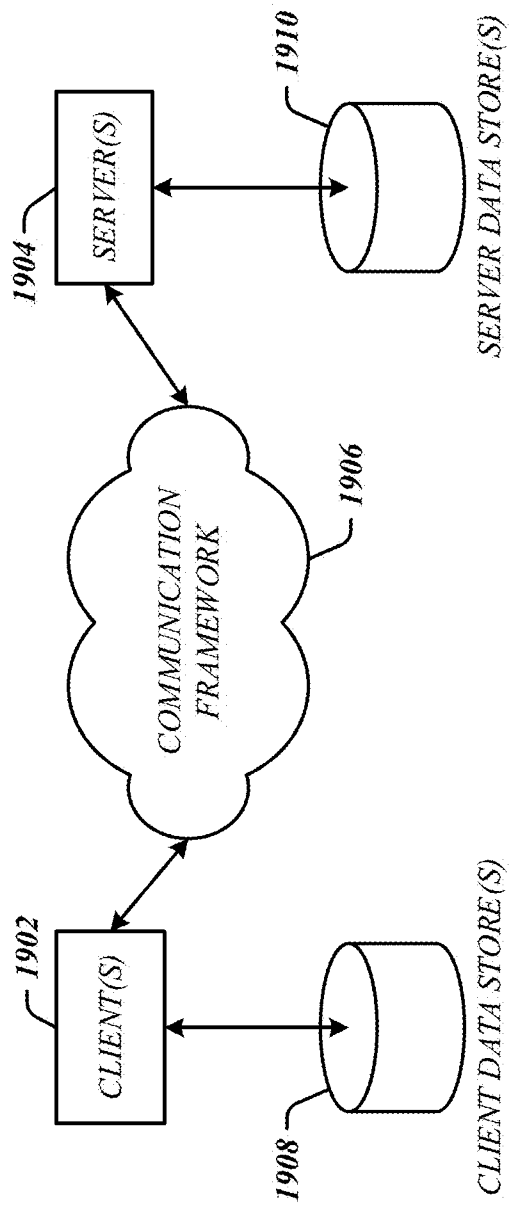

1904
SERVER(S)
1910
SERVER DATA STORE(S)
COMMUNICATION FRAMEWORK
1906
1902
CLIENT(S)
1908
CLIENT DATA STORE(S)

FIG. 19

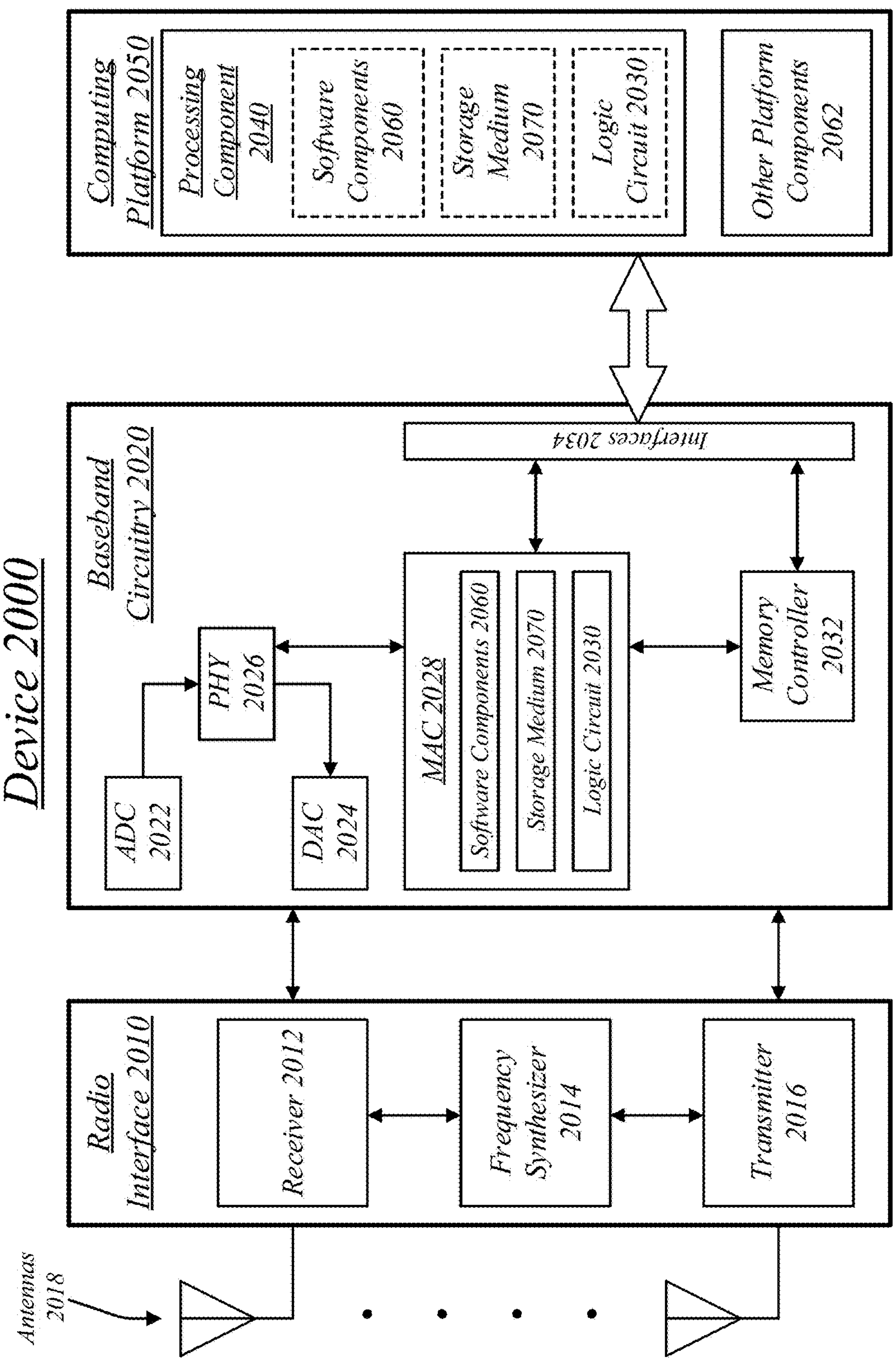

Device 2000
Computing Platform 2050
Processing Component 2040
Software Components 2060
Storage Medium 2070
Logic Circuit 2030
Other Platform Components 2062
Baseband Circuitry 2020
Interfaces 2034
ADC 2022
DAC 2024
PHY 2026
MAC 2028
Software Components 2060
Storage Medium 2070
Logic Circuit 2030
Memory Controller 2032
Radio Interface 2010
Receiver 2012
Frequency Synthesizer 2014
Transmitter 2016
Antennas 2018

FIG. 20

TECHNIQUES FOR ANIMATING STICKERS WITH SOUND

BACKGROUND

Interpersonal communication has progressed from the written word and voice communication to instantaneous communications that may include text, images, video, and sound. Many sources of multimedia content exist from which a user can select content created by others to send in a communication. In order to create customized content, however, users may need specialized skills or access to specialized software tools that are out of reach to many users. It is with respect to these and other considerations that the present improvements are needed.

SUMMARY

The following presents a simplified summary in order to provide a basic understanding of some novel embodiments described herein. This summary is not an extensive overview, and it is not intended to identify key/critical elements or to delineate the scope thereof. Its sole purpose is to present some concepts in a simplified form as a prelude to the more detailed description that is presented later.

Various embodiments are generally directed to techniques for animating stickers with sound. Some embodiments are particularly directed to techniques for animating stickers with sound while the sound is being received. In one embodiment, for example, a method may include receiving a first control directive to select an image representing a set of animation frames in a user interface view of an application executing on a first mobile device; receiving a second control directive to begin receiving audio input in the user interface view; receiving audio input by the first mobile device; animating the image according to an energy level of the audio input using the animation frames; and presenting the animated image concurrently with receiving the audio input. Other embodiments are described and claimed.

To the accomplishment of the foregoing and related ends, certain illustrative aspects are described herein in connection with the following description and the annexed drawings. These aspects are indicative of the various ways in which the principles disclosed herein can be practiced and all aspects and equivalents thereof are intended to be within the scope of the claimed subject matter. Other advantages and novel features will become apparent from the following detailed description when considered in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates an embodiment of an execution system for securing delivery of an animated message.

FIG. **2** illustrates an embodiment of a mobile device for the system of FIG. **1**.

FIG. **3** illustrates an embodiment of a message application component for the system of FIG. **1**.

FIG. **4** illustrates an embodiment of a messaging system for the system of FIG. **1**.

FIG. **5** illustrates an embodiment of an image set for the system of FIG. **1**.

FIG. **6** illustrates an embodiment of a mapping of energy level to images for the system of FIG. **1**.

FIG. **7** illustrates an embodiment of a message flow for the system of FIG. **1**.

FIG. **8** illustrates an embodiment of a second message flow for the system of FIG. **1**.

FIG. **9** illustrates an embodiment of a third message flow for the system of FIG. **1**.

FIG. **10** illustrates a diagram of a user interface for the system of FIG. **1**.

FIG. **11** illustrates a diagram of a second user interface for the system of FIG. **1**.

FIG. **12** illustrates a diagram of a third user interface for the system of FIG. **1**.

FIG. **13** illustrates a diagram of a fourth user interface for the system of FIG. **1**.

FIG. **14** illustrates an embodiment of a centralized system for the system of FIG. **1**.

FIG. **15** illustrates an embodiment of a distributed system for the system of FIG. **1**.

FIG. **16** illustrates an embodiment of a logic flow for the system of FIG. **1**.

FIG. **17** illustrates an embodiment of a second logic flow for the system of FIG. **1**.

FIG. **18** illustrates an embodiment of a computing architecture.

FIG. **19** illustrates an embodiment of a communications architecture.

FIG. **20** illustrates an embodiment of a device for use in a multicarrier OFDM system.

DETAILED DESCRIPTION

Various embodiments are generally directed to techniques for animating images, referred to herein as stickers, with sound. Some embodiments are particularly directed to techniques for animating a sticker while the sound is being produced and received, such that the animation appears to coincide with the sound. The animated sticker may be saved and may be sent to others as a message. A sticker may be a visual representation, such as a graphical user interface element (e.g., an object, icon, image, picture, etc.).

The operator of a mobile computing device may select a sticker for animation in an animation application, and may begin speaking. While the operator is speaking, the audio input of the speech is received and analyzed. The energy level of the audio input may be measured and used to select various animation frames to output in sequence to create the animation. The energy level measurements and animation frame selection and output may occur quickly enough that the animation appears to the human operator to coincide with the speech. This allows the operator to see the animation right away while they are speaking, and to create customized animated stickers that can be saved and/or sent to others, without needing any animation expertise on the part of the operator.

With general reference to notations and nomenclature used herein, the detailed descriptions which follow may be presented in terms of program procedures executed on a computer or network of computers. These procedural descriptions and representations are used by those skilled in the art to most effectively convey the substance of their work to others skilled in the art.

A procedure is here, and generally, conceived to be a self-consistent sequence of operations leading to a desired result. These operations are those requiring physical manipulations of physical quantities. Usually, though not necessarily, these quantities take the form of electrical, magnetic or optical signals capable of being stored, transferred, combined, compared, and otherwise manipulated. It proves convenient at times, principally for reasons of common usage, to refer to these signals as bits, values, elements, symbols, characters, terms, numbers, or the like. It should be noted, however, that all of these and similar terms are to be associated with the appropriate physical quantities and are merely convenient labels applied to those quantities.

Further, the manipulations performed are often referred to in terms, such as adding or comparing, which are commonly associated with mental operations performed by a human operator. No such capability of a human operator is necessary, or desirable in most cases, in any of the operations described herein which form part of one or more embodiments. Rather, the operations are machine operations. Useful machines for performing operations of various embodiments include general purpose digital computers or similar devices.

Various embodiments also relate to an apparatus or systems for performing these operations. This apparatus may be specially constructed for the required purpose or it may comprise a general purpose computer as selectively activated or reconfigured by a computer program stored in the computer. The procedures presented herein are not inherently related to a particular computer or other apparatus. Various general purpose machines may be used with programs written in accordance with the teachings herein, or it may prove convenient to construct a more specialized apparatus to perform the required method steps. The required structure for a variety of these machines will appear from the description given.

Reference is now made to the drawings, wherein like reference numerals are used to refer to like elements throughout. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding thereof. It may be evident, however, that the novel embodiments can be practiced without these specific details. In other instances, well known structures and devices are shown in block diagram form in order to facilitate a description thereof. The intention is to cover all modifications, equivalents, and alternatives consistent with the claimed subject matter.

FIG. **1** illustrates a block diagram for an animated messaging system **100** for communicating using animated stickers. In one embodiment, the system **100** may comprise a computer-implemented system **100** having a mobile device **110** operated by a sender, and a remote messaging client **150** executing on a mobile device operated by a recipient, each comprising one or more components. Although the system **100** shown in FIG. **1** has a limited number of elements in a certain topology, it may be appreciated that the system **100** may include more or fewer elements in alternate topologies as desired for a given implementation. As shown in FIG. **1**, the sender and the recipient may be carrying out a messaging conversation with the exchange of at least one animated message **140**.

A mobile device **110** may be any mobile electronic device capable of, at least, receiving audio data and/or recording audio data from a microphone, outputting audio data to the sender, and communicating with other devices to exchange data and instructions over a network. The mobile device **110** may communicate with other devices using wireless transmissions to exchange network traffic. Exchanging network traffic, such as may be included in the exchange of an animated message **140**, may comprise transmitting and receiving network traffic via a network interface controller (NIC). A NIC comprises a hardware component connecting a computer device, such as mobile device **110**, to a computer network. The NIC may be associated with a software network interface empowering software applications to access and use the NIC. Network traffic may be received over the computer network as signals transmitted over data links. The network traffic may be received by capturing these signals and interpreting them. The NIC may receive network traffic over the computer network and transfer the network traffic to memory storage accessible to software applications using a network interface application programming interface (API).

The mobile device **110** may perform various operations using network data accessed over a network. The mobile device **110** may access a cellular system **130** using cellular signals **135**. The cellular system **130** may be a cellular network including data access, the cellular system **130** provided by a cellular provider with which the user of the mobile device **110** has a service contract, the service contract for cellular data service to the mobile device **110**. The mobile device **110** may use the cellular system **130** to access the public Internet **160** for interacting with one or more other devices.

The mobile device **110** may access one or more Wi-Fi access points **120** using Wi-Fi signals **145**. Wi-Fi access points **120** may be provided by a plurality of different operators. Some of the Wi-Fi access points **120** may be personal in nature, such as a home Wi-Fi network operated by the user of mobile device **110** based on a domestic Internet connection. Some of the Wi-Fi access points **120** may be free of charge or provided as a complimentary portion of a service, such as free Wi-Fi service in coffee shops, hotels, and other public accommodations. The mobile device **110** may use Wi-Fi access points **120** to access the public Internet **160** for interacting with one or more other devices. The dashed line between the Internet **160** and mobile device **110** indicates that an animated message **140** may be exchanged with other devices ultimately using the Internet **160**, with one of the cellular system **130** and Wi-Fi access point **120** acting as the medium to access the Internet **160**.

The system **100** may also include a remote messaging client **150**. The remote messaging client **150** may be software and/or a combination of software and hardware operating on any electronic device capable of sending and receiving an animated message **140** to and from the mobile device **110**. The remote messaging client **150** may operate on a mobile device such as a smartphone or tablet computer, or may be a laptop computer, a desktop computer, or a telephone system with messaging capability.

The remote messaging client **150** may provide messaging operations in any of a variety of ways. The remote messaging client **150** may be, for example, and without limitation, an electronic mail application, a short-message-service (SMS) message application, a multimedia-message-service (MMS) message application, a group communication application, a telephone voicemail system application, a video-communication application, and so forth. The remote messaging client **150** may accept an address for a recipient, such as an e-mail address, a chat handle, a telephone number, a user name within a social network service, and so forth.

FIG. **2** illustrates a block diagram of a mobile device **200** and messaging server **220** for the system **100**. The mobile device **200** may be an embodiment of mobile device **110**. The mobile device **200** may include various hardware components and software components. The hardware components may include various audio output components **202**, a camera **204**, a microphone **206**, a display component **208**, and a touch sensitive interface **210**. Other hardware components may also be included, such as various other input components, e.g. a keyboard or keypad, as well as a global positioning system (GPS) component, an altimeter, and so forth.

The audio output components **202** may include any components operative to output sound waves, such as an earpiece speaker, a loudspeaker, and/or an audio-out connection. The audio output components **202** may include hardware and/or software that converts between analog and digital sound data.

The camera **204** may be a camera integrated into the mobile device **200** that can take digital photographs through a lens and store the digital photos. In some embodiments, the camera **204** may use the display component **216** to display the scene that will be photographed, and to display stored photos.

The microphone **206** may be any device capable of receiving sound waves, e.g. spoken by a human operator, and converting the received sound waves into electrical signals and/or data that can be stored and transmitted to other devices. The microphone **206** may be integrated into the mobile device **200**, or may be an external microphone coupled to the mobile device **200** wirelessly or through an external wired connection. The microphone **206** may be for example, a component of a head-set, earpiece, or other hands-free communication device that communicates with the mobile device **200** via a short-range signal technology such as BLUETOOTH® technology. The embodiments are not limited to this example.

The display component **208** may include any interface components capable of presenting visual information to the sender, such as, but not limited to, a screen for visual output.

The touch sensitive interface **210** may include a surface that detects touch from, for example, a human finger or a stylus, and converts the touch into a command directive. Various touch gestures that may be detected may include, for example, a single tap, a double tap, a circling gesture, a sliding gesture, a dragging gesture, a multiple-finger gesture, and so forth. The mapping of a touch gesture to a control directive may be dependent on the application operating on the mobile device **200** when the touch is detected, or may be independent of any application. In some embodiments, the display component **208** and the touch sensitive interface **210** may be integrated into one touch sensitive display screen.

The mobile device **200** may further include a storage component **214** in the form of one or more computer-readable storage media capable of storing data and instructions for the functions of software, such as a message application component **230**, an animation application component **250**, and an operating system **290**. As used herein, "computer-readable storage medium" is not intended to include carrier waves, or propagating electromagnetic or optical signals.

The mobile device **200** may include various software components, such as a message application component **230** and an animation application component **250**. The message application component **230** may comprise instructions that when executed by a processing circuit (not shown) cause the mobile device **200** to perform the operations of the message application component **230** as will be described herein. Generally, the message application component **230** may be provided on the mobile device **200** at the time of purchase, or may installed by the sender, and may enable the creation, communication, and playback of messages in a variety of formats, including, but not limited to, animated stickers, audio messages, text, and video.

The message application component **230** may allow the sender to communicate with others, e.g. with a recipient, by sending and receiving messages, including animated messages **140**, in a manner analogous to text messaging. The message application component **230** may be a message application that uses alphanumeric text, such as a simple message service (SMS) application, or a social network application that allows its members to communicate with messages.

The animation application component **250** may display visual representations of sticker sets that can be selected by the sender for animation. A visual representation may be one of the images within a sticker set. The animation application component **250** may receive audio data, for example, as the operator speaks into a microphone. The animation application component **250** may analyze the energy levels of the received audio data as it is received. The images within a selected sticker set may be mapped to the energy levels and displayed sequentially while the audio data is received. In an embodiment, this mapping and displaying may be done apparently in real-time. That is, the sticker may appear, to a human operator, to move in synchronization with the energy levels of the incoming audio data. The combination of a sequence of images in a sticker set and audio data may be referred to herein as an animated sticker.

The animation application component **250** may allow a user to select one or more animated stickers to send as an animated message **140** via the message application component **230**. An animated message **140** may include the data of the recorded audio, e.g. a data file of the audio data, and a selected sticker set. In some embodiments, the animated message **140** may include each image file in sequence as mapped to the energy levels of the associated audio data. In other embodiments, the sequence of images may be represented by identifiers of the images, which can be used by an animation server or a remote messaging client to re-create the animation remotely, without having to transmit each image file.

For example, the operator may speak, which may be recorded by the microphone **206**. The recorded speech may be mapped to a set of images in a sticker set resulting in an animated message **140**, which may be transmitted to the remote messaging client **150**. The remote messaging client **150** may present the animated message **140**, and may respond in kind using the remote messaging client **150**.

The mobile device **200** may store some sticker sets on the device in the local sticker sets **212**, e.g. in the storage component **214**. A sticker set **212** may be a collection of related static images, referred to as animation frames, that, when presented at a particular frame rate on a display, appear as an animated image. The local sticker sets **212** may include animated stickers that were previously created and/or received, and/or sticker sets that have not been animated.

Accordingly, the message application component **230** and the animation application component **250** may operate to allow the user of the mobile device **200** to compose and/or record messages, e.g. an animated message **140**, to send the message to a recipient, as well as to receive messages from others and present the animated messages to the user. In some embodiments, the message application component **230** and the animation application component **250** may be separate stand-alone applications. In other embodiments, the message application component **230** may include the animation application component **250**. The animation application component **250** will be described in greater detail with respect to FIG. **3**.

The mobile device **200** may include a communications component **240**. The communications component **240** may include one or more hardware and/or software components that allow the transmission and receiving of signals by the mobile device **200**. The communications component **240** may include the hardware and/or instructions to communicate on a data network, such as over a long-term evolution (LTE) network. The communications component **240** may include the hardware and/or instructions to communicate in a shorter-range network, such as by Wi-Fi or by BLUETOOTH®. The communications component **240** may include the hardware and/or instructions to communicate on a cellular telephone network, such as cellular system **130**. The communications component **240** may support peer-to-peer network connections, and may be able to detect when other mobile devices are available for a peer-to-peer connection.

The system **100** may also include one or more servers **220**. The server **220** may include any computing device capable of communication with other computing devices such as mobile device **110** and remote messaging client **150** over a network to exchange data and instructions. The server **220** may be embodied in a single device or with multiple devices.

The server **220** may store sticker sets **222**. A sticker set **222** may be a collection of related static images that, when presented at a particular frame rate on a display, appear as an animated image. The sticker sets **222** may be available to all users of the animation application component. Some of the sticker sets **222** may be provided free of charge to the users, while others may have a fee associated with their use. In some embodiments, some of the sticker sets **222** may already be associated with a particular audio recording, while others may be unassociated with any audio recordings.

The server **220** may include a message server component **224**. The message server component **224** may provide message storage and transmission operations for the messaging service. The operations of the message server component **224** are described in greater detail with respect to FIG. **4** below.

The mobile device **200** as shown in FIG. **2** is an example and is not limited to the components shown. More, fewer, or other components may be used to provide the described functionality. Additionally, some of the components may be combined into other functional units without departing from the concepts herein.

FIG. **3** illustrates a block diagram of an animation application component **350** for the system **100**. The animation application component **350** may be an embodiment of the animation application component **250**. The animation application component **350** may include various functional components to perform the methods and operations described herein, such as, but not limited to, a graphical user interface (GUI) generator **332**, a sticker recorder **334**, an energy analyzer **336**, and a sticker animator **338**. More, fewer, or other components may be used to provide the described functionality.

The GUI generator **332** may present various visual elements that convey information to an operator of the device on which the animation application component **350** is executing. The visual components may also provide functionality when selected with a control directive, such as with a touch gesture.

In particular, the GUI generator **332** may present images representing a sticker set of animation frames that the operator can select and animate. The GUI generator **332** may receive a first control directive to select an image and may receive a second control directive to begin recording audio input. While the audio input is received, the GUI generator **332** may present an animated image created from the selected sticker set of animation frames and the received audio input.

The sticker recorder **334** may receive audio input in response to the second control directive from a microphone, e.g. the microphone **206**, and may store the received audio input at least long enough to add the recorded audio to an animated message **140**. The sticker recorder **334** may also be used to record and generate an audio file that can be made into an animated message.

The energy analyzer **336** may measure an energy level of the audio input. The energy level measurements may be made periodically or may be made substantially continuously. At periodic intervals, the energy analyzer **336** may determine a range of energy levels of previously received audio input over a period from a first past time to a present time. The periodic interval may be related or tied to an animation frame rate, for example and without limitation, 30 times per second, every tenth of a second, every 50 milliseconds, and so forth. The period used to determine the range of energy levels may be the same as the energy level measurements period or may be different. The energy level of the audio input may be measured in decibels, watts, or any unit that allows a differentiation between perceived "loud" and "quiet" sounds.

The energy analyzer **336** may divide the determined range of energy levels into a plurality of sub-ranges, and determine which sub-range corresponds to the measured energy level of the present audio input. In some embodiments, the energy analyzer **336** may normalize the determined range.

The sticker animator **338** may animate the selected image according to the energy levels of the audio input. The animation may occur concurrently the receiving of the audio input in such a way as to appear, to a human operator, that the image is moving in conjunction with the audio input. For example, the sticker animator **338** may map each animation frame in the set of animation frames to a different one of the sub-ranges. For a determined sub-range of the present audio input, the sticker animator **338** may select the animation frame that is mapped to the determined sub-range for output. The GUI generator **332** may present, at each periodic interval, the selected animated image in a sequence of selected animation frames concurrently with output of the present audio input. In some embodiments, the sticker animator **338** may be able to apply post-animation effects such as sound or voice distortion, background music, or other alterations to the audio input. Alternatively, or in addition, the post-animation effects may be provided by a remote server, such as server **220**.

FIG. **4** illustrates an embodiment of a plurality of servers implementing various functions of a messaging system **400**. It will be appreciated that different distributions of work and functions may be used in various embodiments of a messaging system **400**. The messaging system **400** may be an embodiment of the message server component **224**.

The messaging system **400** may comprise a domain name front end **410**. The domain name front end **410** may be assigned one or more domain names associated with the messaging system **400** in a domain name system (DNS). The domain name front end **410** may receive incoming connections and distribute the connections to servers providing various messaging services.

The messaging system **400** may comprise one or more chat servers **414**. The chat servers **414** may comprise front-end servers for receiving and transmitting user-to-user messaging updates such as chat messages and including animated messages **140**. Incoming connections may be assigned to the chat servers **414** by the domain name front end **410** based on workload balancing.

The messaging system **400** may comprise backend servers **430**. The backend servers **430** may perform specialized tasks in the support of the chat operations of the front-end chat servers **414**. A plurality of different types of backend servers **430** may be used. It will be appreciated that the assignment of types of tasks to different backend serves **430** may vary in different embodiments. In some embodiments some of the backend services provided by dedicated servers may be combined onto a single server or a set of servers each performing multiple tasks divided between different servers in the embodiment described herein. Similarly, in some embodiments tasks of some of dedicated back-end servers described herein may be divided between different servers of different server groups.

The messaging system **400** may comprise one or more offline storage servers **431**. The one or more offline storage servers **431** may store messaging content for currently-offline messaging endpoints in hold for when the messaging endpoints reconnect.

The messaging system **400** may comprise one or more animation servers **432**. The one or more animation servers **432** may include one or more sticker sets for use by message application components **330**. Sticker sets may include, for any particular set, two or more images, also referred to as animation frames. A sticker set may be represented by one of the images in the set. The animation servers **432** may present a representative image for a sticker set in an interface of a message application component to allow an operator to select a sticker set for animation.

The one or more animation servers **432** may allow users of the messaging system **400** to create their own animated stickers, and to send the animated sticker to other users. In some embodiments, the animation servers **432** may perform some or all of the animation operations. For example, the animation servers **432** may receive a selection of a sticker set, the recorded audio data, and the analyzed energy data, and may map the images in the sticker set to the audio data. The audio data and the mapped sequence of images may be saved as an animated sticker.

In some embodiments, the animation servers **432** may provide enhancements to an animated sticker. For example, the animation servers **432** may modify an animated sticker with audio distortion effects and/or with image distortion effects. An audio distortion effect may include, for example, changing the pitch or frequency of the audio data, adding sound effects or music, or any other change to the audio portion of an animated sticker. Image distortion effects may include, for example, changing colors or apparent lighting, adding a flashing or strobe effect, and so forth.

The messaging system **400** may comprise one or more presence servers **433**. The one or more presence servers **433** may maintain presence information for the messaging system **400**. Presence information may correspond to user-specific information indicating whether or not a given user has an online messaging endpoint and is available for chatting, has an online messaging endpoint but is currently away from it, does not have an online messaging endpoint, and any other presence state.

The messaging system **400** may comprise one or more push storage servers **434**. The one or more push storage servers **434** may cache push requests and transmit the push requests to messaging endpoints. Push requests may be used to wake messaging endpoints, to notify messaging endpoints that a messaging update is available, and to otherwise perform server-side-driven interactions with messaging endpoints.

The messaging system **400** may comprise one or more group servers **434**. The one or more group servers **434** may maintain lists of groups, add users to groups, remove users from groups, and perform the reception, caching, and forwarding of group chat messages.

The messaging system **400** may comprise one or more last seen information servers **436**. The one or more last seen information servers **436** may receive, store, and maintain information indicating the last seen location, status, messaging endpoint, and other elements of a user's last seen connection to the messaging system **400**.

The messaging system **400** may comprise one or more key servers **437**. The one or more key servers **437** may host public keys for public/private key encrypted communication.

The messaging system **400** may comprise one or more profile photo servers **438**. The one or more profile photo servers **438** may store and make available for retrieval profile photos for the plurality of users of the messaging system **400**.

The messaging system **400** may comprise one or more multimedia servers **439**. The one or more multimedia servers **439** may store multimedia (e.g., images, video, audio) in transit between messaging endpoints, and multimedia cached for offline endpoints, and may perform transcoding of multimedia.

The messaging system **400** may comprise one or more payment servers **441**. The one or more payment servers **441** may process payments from users. Payments may be received, for example, when one or more animated stickers are purchased, and/or when a connection to a cellular data network is purchased. The one or more payment servers **441** may connect to external third-party servers for the performance of payments.

The messaging system **400** may comprise one or more registration servers **442**. The one or more registration servers **442** may register new users of the messaging system **400**.

The messaging system **400** may comprise one or more voice relay servers **443**. The one or more voice relay servers **443** may relay voice-over-internet-protocol (VoIP) voice communication between messaging endpoints for the performance of VoIP calls.

The messaging system **400** may include an authorization server (or other suitable component(s)) that allows users to opt in to or opt out of having their actions logged by the animated messaging system **100** or shared with other systems (e.g., third-party systems), for example, by setting appropriate privacy settings. A privacy setting of a user may determine what information associated with the user may be logged, how information associated with the user may be logged, when information associated with the user may be logged, who may log information associated with the user, whom information associated with the user may be shared with, and for what purposes information associated with the user may be logged or shared. Authorization servers or other authorization components may be used to enforce one or more privacy settings of the users of the animated messaging system **100** and other elements of a social-networking system through blocking, data hashing, anonymization, or other suitable techniques as appropriate.

FIG. **5** illustrates an embodiment of a set of animation frames **500** in a sticker set for the system of FIG. **1**. A set of animation frames may comprise two or more static images that, when presented in succession at a specific frame rate on a display, appear to be a moving image, also referred to herein as an animated image or animated sticker. As illustrated in FIG. **5**, a set of animation frames may include four images: image **510**, image **520**, image **530**, and image **540**. More or fewer images may be used in a set of animation frames.

Each image may differ in some respect from the other images in the set. For example, in the set of animation frames **500**, the images differ in a size of a mouth opening. Images in a set of animation frames may vary in other ways, for example, and without limitation, in a position within a frame border, in eye size opening, in facial expression, or any other variations that create animation when presented at a frame rate. Images in a set of animation frames may vary in multiple ways simultaneously, for example, both the size of the mouth opening and the size of the eye opening may change from image to image.

Each sticker set may have an associated identifier to distinguish it from other sticker sets available from a messaging service. Each image in a sticker set may have an associated identifier. The identifier may be unique within the sticker set, or may be unique among all of the sticker sets available through a messaging service. Additionally, each image in the sticker set may include information that indicates whether it should be mapped to a lower energy level or a higher energy level. The images within a sticker set may, accordingly, have an ordering relative to each other in the energy levels that they represent.

FIG. **6** illustrates an embodiment of a mapping **600** of energy level to images for the system of FIG. **1**. The mapping **600** illustrates a simplified animation of the animation frames shown in FIG. **5**.

As shown in FIG. **6**, energy level measurements **610**, **620**, **630** and **640** are shown on a graph. Time is represented by the X-axis, and energy level is represented by the Y-axis. Assume, for the purpose of demonstration, that a range of energy levels was determined from previously received recent audio input, e.g. from the past quarter of a second. The range of energy levels is represented as the energy level range between horizontal lines **604-1** and **604-5**. Because there are four animation frames in the selected sticker set, the range is divided into four sub-ranges, represented as the range between the following pairs of horizontal lines: **604-1** to **604-2** (range A), **604-2** to **604-3** (range B), **604-3** to **604-4** (range C), and **604-4** to **604-5** (range D).

Periodic intervals are represented by vertical lines **602-1**, **602-2**, **602-3**, and **602-4**. At each periodic interval, the energy analyzer **336** may measure the energy level of the current audio input. The sticker animator **338** may receive the measured energy level **610** from the energy analyzer **336**, and may determine in which of the four sub-ranges the measured energy level **610** falls. Alternatively, the energy analyzer **336** may provide the sub-range to the sticker animator **338**. In this example, the measured energy level **610** falls in sub-range C.

The sticker animator **338** has mapped the four images **510**, **520**, **530**, and **540** to the four sub-ranges A, B, C, and D, respectively. Upon the determination that the measured energy level **610** is in sub-range C, the sticker animator **338** selects image **530** as the next image in the animation sequence. The image **530** may be output by the GUI generator **332**. The image **530**, or an identifier for image **530**, may be stored in a sequence for later output.

The process may repeat at periodic interval **602-2**. At this interval, the measured energy level **620** is lower, and falls in sub-range A. Image **510** is selected for output because image **510** is mapped to sub-range A.

The process may repeat at periodic interval **602-3**. At this interval, the measured energy level **630** is higher, and falls in sub-range D. Image **540** is selected for output because image **540** is mapped to sub-range D.

The process may repeat at periodic interval **602-4**. At this interval, the measured energy level **640** is lower, and falls in sub-range B. Image **520** is selected for output because image **520** is mapped to sub-range B.

When the sequence of images **530**, **510**, **540**, and **520** are output at a suitable frame rate, the mouth size of the image appears to the human operator to open larger or smaller in conjunction with a change in the loudness of the audio input.

While the illustrated example includes a sticker set having four animation frames, and uses four sub-ranges, more or fewer animation frames and sub-ranges may be used.

FIG. **7** illustrates a message flow diagram **700** for the system **100**. The message flow **700** may represent messages communicated among the components of system **100**. As used in FIG. **7**, a "message" may include data and/or instructions communicated from one component to another, as well as internal functions within a component. In particular, the message flow **700** may occur among the components of the mobile device **110**, **200**, and more particularly, among the components of the animation application component **350**.

In message flow **700**, time flows from the top of the diagram toward the bottom. Message flow **700** may represent messages communicated when an operator creates an animated sticker using mobile device **110**.

The message flow **700** begins when the GUI generator **332** presents sticker images, in message **702**. The GUI generator **332** may present one or more static images in a section of the display component, where each static image represents a different sticker set. The static image may be one of the animation frames in the sticker set.

The message flow **700** continues when the GUI generator **332** receives a control directive selecting a sticker image, in message **704**. The operator may, for example, touch a sticker image with a finger tip or stylus, use a spoken command to select a specific sticker image, or use any other available input mechanism to indicate a selection of one sticker image. The GUI generator **332** may update a UI view to show the selected sticker image, for example, in a larger size and/or in a separate section of the display component.

The message flow **700** continues when the GUI generator **332** receives a second control directive to begin recording audio input, in message **706**. For example, the operator may select a "record" UI element. In some embodiments, the first control directive of message **704** may also cause the microphone to begin receiving and recording audio input, without a second control directive.

The message flow **700** continues when the GUI generator **332** causes the energy analyzer **336** to begin receiving the audio input, in message **708**. In some embodiments, the energy analyzer **336** may automatically begin receiving the audio input as soon as the microphone is active, while the animation application component **350** is executing on the mobile device.

The message flow **700** continues as the energy analyzer **336** measures the audio input to determine a range of energy levels, in message **710**. The energy analyzer **336** may measure the energy level of audio input at a current time, and may store past measurements. The energy analyzer **336** may, for example, store the last one second's worth of energy level measurements. More or fewer energy level measurements may also be stored. In some embodiments, the energy analyzer **336** may only store a highest and lowest measured energy level in order to determine the range of energy levels. The energy analyzer **336** may normalize the determined range, in order to make the high and low values consistent over the time of the animation.

Determining the range of energy levels may also include dividing the range into two or more sub-ranges. The number of sub-ranges may match the number of animation frames in the selected sticker set.

The message flow **700** continues as the energy analyzer **336** provides the measured energy levels to the sticker animator **338**, in message **712**. The energy level **336** may send the message **712** at periodic intervals, for example, at a period that corresponds to a frame rate of the animation. The message **712** may also include information about the sub-ranges. For example, the message **712** may include the top and bottom energy levels of each sub-range, or may include an identification of which sub-range the current energy level measurement falls into. Messages **710** and **712** may repeat until no more audio input is received.

The message flow **700** continues when the sticker animator **338** selects an animation frame, in message **714**. In some embodiments, the message **712** may include an indication of a sub-range in the range of energy levels that a current energy level measurement falls into. In other embodiments, the message **712** may include the energy level measurement. The sticker animator **338** may have a mapping of animation frames in the selected sticker set to the subranges of measured energy levels. The sticker animator selects the animation frame that maps to the sub-range of the measured energy level provided in the message **712**.

The message flow **700** continues when the sticker animator **338** provides the selected animation frame to the GUI generator **332**, in message **716**. The sticker animator **338** may provide an identifier of which animation frame to present, or may provide the actual animation frame image file to the GUI generator **332**. The sticker animator **338** may also store a sequence of selected animation frames in order to reproduce the animation subsequently.

The message flow **700** continues when the GUI generator **332** presents the animation frame, in message **718**. The animation frame may be presented visually in a section of the display component.

The message flow **700** continues until a control directive is received to end receiving audio input, in message **720**. The operator may, for example, press a "stop" UI element, release a pressed "record" UI element, slide a fingertip away from a "record" UI element, or simply stop speaking for a specified period of time.

The messages **708**, **710**, **712**, **714**, **716**, and **718** are repeated until the message **720** is received. Presentation of the animation frames in message **718** may occur at a frame rate such that the animation appears to a human observer to be continuous smooth movement, rather than a series of distinct still images. The frame rate may be, for example and without limitation, 18 frames per second (fps), 30 fps, 48 fps, or any other rate that creates a continuous smooth movement visual effect.

FIG. **8** illustrates an embodiment of a message flow **800** for the system **100**. **100**. The message flow **800** may represent messages communicated among the components of system **100**. As used in FIG. **8**, a "message" may include data and/or instructions communicated from one component to another, as well as internal functions within a component, and is distinct from the animated messages **140** sent from a sender to a recipient. In particular, the message flow **800** may occur among the components of the mobile device **110**, **200**.

In message flow **800**, time flows from the top of the diagram toward the bottom. Message flow **800** may represent messages communicated during a message communication session where a sender selects an animated sticker to send. The message flow **800** assumes that the animation application component **350** is executing on the mobile device **110**, **200**. The message flow **800** may begin when the message flow **700** ends.

The message flow **800** begins when the animation application component **350** presents an animated sticker, in message **802**. For example, the animation application component **350** may present a static image representing the animated sticker on a display component of the mobile device. A playback UI element may be presented on or near the static image. Alternatively, presenting the animated sticker may include outputting the audio data to an audio output, and simultaneously presenting the animation frames on the display component in the sequence specified by the animated sticker at a specified frame rate.

The message flow **800** continues when the animation application component **350** presents options related to the animated sticker, in message **804**. For example, the GUI generator **332** of the animation application component **350** may present UI elements on the display component for various operations, including, but not limited to, saving the animated sticker, deleting the animated sticker, sending the animated sticker as a message, or adding effects to the animated sticker.

The message flow **800** continues when the animation application component **350** receives a control directive to send the animated sticker as an animated message, in message **806**. For example, the operator may touch a "send" UI element with a fingertip or stylus, may speak a "send" command into a microphone, or use any other input mechanism to select the "send" operation.

The message flow **800** continues when the animation application component **350** instructs the message application component **230** to create an animated message, in message **808**. The message **808** may include a "new message" command, and may include links to one or more data files that comprise the animated sticker. The message **808** may alternatively include the actual one or more data files that comprise the animated sticker. The one or more data files that comprise the animated sticker may be a single data file that can be played analogously to a video file. In other embodiments, the one or more data files may include a more deconstructed version of the animated sticker comprising an audio file, the animation frames or identifiers for the animation frames, and sequence data that specifies an order in which to present the animation frames.

The message flow **800** continues when the message application component **230** presents a message composition user interface, in message **810**. The message composition UI may present, on the display component, UI elements for selecting a recipient, and/or for adding additional content to the message, such as text. The embodiments are not limited to these examples.

The message flow **800** continues when the message application component **230** receives message input, in message **812**. The message input may include one or more selected recipients, as well as any additional content.

The message flow **800** continues when the message application component **230** constructs the animated message, in message **814**. The animated message may be in the form of a data packet that includes fields to hold the one or more data files that comprise the animated sticker and a destination for the animated message, e.g. a telephone number, network address, e-mail address and so forth.

The message flow **800** continues when the message application component **230** provides the animated message to the communications component **240** in message **816**. In some embodiments, the message application component **230** may pass the animated message to the communications component **240**. In other embodiments, the message application component **230** may store the animated message and may provide a storage location to the communications component **240** to enable the communications component **240** to retrieve the animated message. The embodiments are not limited to these examples.

The message flow **800** continues when the communications component **240** sends the animated message to the recipient, in message **818**. The communications component **240** may use any available data network to send the animated message.

FIG. **9** illustrates of a message flow **900** for the system **100**. The message flow **900** may represent messages communicated among the components of system **100**. As used in FIG. **9**, a "message" may include data and/or instructions communicated from one component to another, as well as internal functions within a component, and is distinct from the animated messages **140** sent from a sender to a recipient.

In message flow **900**, time flows from the top of the diagram toward the bottom. Message flow **900** may represent messages communicated during a message communication session where an animated message is sent to and received by a mobile device. The message flow **900** assumes that the animation application component **350** is executing on the mobile device **110**, **200**.

The message flow **900** may begin when the remote messaging client **150** sends an animated message **140** to the messaging system **400** in message **902**. The animated message **140** included in message **902** may include an address field, the audio component of the animated sticker, and the animation frames or identifiers of the animation frames, along with a sequence in which to present the animation frames. The message **902** may also include a request or command to apply one or more after effects to the animated sticker.

The message flow **900** may continue when the messaging system **400** applies any requested after effects, in message **904**. For example, the messaging system **400** may alter one or more characteristics of the audio file, or add sound effects to the audio data.

The message flow **900** may continue when the messaging system **400** stores the animated message in message **906**. Storing the animated message may allow the intended recipient to retrieve the animated message at a later time, for example, if the recipient is not online or otherwise connected to the messaging system **400** when the animated message is sent.

The message flow **900** may continue when the messaging system **400** sends a message notification to the remote messaging client **150**, in message **908**. The message **908** may cause the remote messaging client **150** to present an audio and/or visual alert that an animated message is available for the recipient.

The message **908** may include a link or retrieval instruction that, when selected, causes the remote messaging client **150** to request the animated message in message **910**.

The message flow **900** may continue when the messaging system **400** sends the animated message to the remote messaging client **150** in message **912**. In some embodiments, the message **912** may include the animated sticker as a single data file. In other embodiments, the message **912** may include a more deconstructed version of the animated sticker comprising the audio file, the animation frames or identifiers for the animation frames, and sequence data that specifies an order in which to present the animation frames.

In some embodiments, the message **912** may be sent without using the notification process of messages **908** and **910**.

The message flow **900** may continue when the remote messaging client **150** presents the animated message, in message **914**. In some embodiments, a static image representing the animated sticker may be displayed near a playback UI element.

The message flow **900** may continue when the remote messaging client **150** receives a control directive selecting to play the received animated sticker, in message **916**. For example, the operator of the mobile device **110**, **200** may touch the playback UI element, or may speak a command, e.g. "play message" into the microphone **206**.

The message flow **900** may continue when the remote messaging client **150** presents the animated sticker, in message **918**. Presenting the animated sticker may comprise outputting the audio data to an audio output, and simultaneously presenting the animation frames on a display component in the sequence specified in the animated message at a specified frame rate.

FIG. **10** illustrates a user interface (UI) **1000** for the system **100**. UI **1000** may be presented on a display component **1008** of mobile device **1010**, which may be embodiments of display component **208** and mobile device **110**, respectively. In the illustrated example, the UI **1000** is for an animation application, such as for animation application component **250**, **350**. The display component **1008** in the illustrated component may be a touch-sensitive screen.

The UI **1000** may represent a landing screen for the messaging app. The UI **1000** may include one or more sections. For example, the UI **1000** may divide the display area of display component **1008** into sections **1020**, **1030** and **1040**. More, fewer or different sections may also be used.

Section **1020** may display a graphical representation **1022** of a selected sticker for animation. Section **1030** may display one or more functional UI elements that enable the creation of an animated sticker and/or sending a message. In the illustrated example, section **1030** displays a record icon **1032**. In some embodiments, the sender may touch or tap the record icon **1032** to activate the microphone **1006**, and then speak his message into the microphone **1006**. As shown in FIG. **10**, no animation operations have occurred.

Section **1040** may display visual representations of sticker sets, such as representation **1042**. The sender may perform one or more touch gestures using his finger **1002** to select a representation for animation. For example, the sender may tap the representation **1042**, or touch and drag the representation **1042** to section **1020** to select it. If a different sticker set is desired, the sender may select a different representation from section **1040**. The embodiments are not limited to these examples.

FIG. **11** illustrates a user interface (UI) **1100**. The UI **1100** may be presented on a display component **1108** of mobile device **1110**, which may be embodiments of display component **208** and mobile device **110**, respectively. The UI **1100** may be very similar to the UI **1000** and/or may be the UI **1000** in a different state. For example, the sections **1120** and **1130** may be analogous to sections **1020** and **1030**, respectively. The record icon **1132** may be the same or analogous to the record icon **1032**.

In the illustrated example, the operator of the mobile device **1110** has begun recording audio data to use in animating the selected sticker. A timer UI element **1134** may show an elapsed time from the beginning of the audio recording. While audio data is received, the animation frames that make up the selected sticker set are displayed according to a measured energy level of the audio data. The sequence of animation frames is presented as animated sticker **1124**. The operator of the mobile device **1110** can view, as he or she speaks, the animation of the sticker set according to the audio data being received. In an embodiment, the recording of audio data and the animation of the sticker set may end when the operator generates a control directive to stop. For example, the operator may release the record icon **1132**, drag a finger or stylus away from the record icon **1132**, tap a separate "stop" UI element (not shown), stop speaking for a predetermined period of time, or any other method of indicating that the recording and animating is to stop.

FIG. **12** illustrates a user interface (UI) **1200**. The UI **1200** may be presented on a display component **1208** of mobile device **1210**, which may be embodiments of display component **208** and mobile device **110**, respectively. In the illustrated example, the UI **1200** is for an animation application, such as for animation application component **250**, **350**. The UI **1200** may reflect a change to the UI **1100** after recording and animating have stopped.

For example, the UI **1200** may present, in section **1220**, a static graphical representation of the animated sticker with a playback UI element **1226** that, when selected, presents the animated sticker to the operator, for example, as a preview.

The UI **1200** may provide various options in the section **1230**. For example, the operator of the mobile device **1210** may use a touch gesture or other control directive to select a send UI element **1236**. A selection of the send UI element **1236** may open an addressing UI component to allow the operator to select one or more recipients. In some embodiments, when the operator is already in a communication session with another user, the send UI element **1236** may automatically send the animated sticker as a message to the other user

The operator of the mobile device **1210** may use a touch gesture or other control directive to select an effects UI element **1238**. A selection of the effects UI element **1238** may open a selection dialog that allows the operator to select one or more after-effects to apply to the animated sticker, for example, various voice distortion effects.

In addition, the operator may save the animated sticker to a storage medium. A stored animated sticker may be viewed or sent later. The operator may delete the animated sticker, removing the audio data and any information about the particular sequence of animation frames used in the animation. The sticker set itself may be retained in the local sticker sets **212**.

FIG. **13** illustrates a user interface (UI) **1300**. The UI **1300** may be presented on a display component **1308** of mobile device **1310**, which may be embodiments of display component **208** and mobile device **110** or **150**, respectively. In the illustrated example, the UI **1300** is for a messaging app, such as for the messaging application component **230**.

The UI **1300** may divide the display component **1308** into several sections. For example, the display component **1308** may be divided into section **1320** and section **1330**. More, fewer or other sections may be used.

Section **1320** may be used to present the messages exchanged between the operator **1302** of the mobile device **1310** and another device, in this example, a device operated by "Anne." In the illustrated example, the presented messages include messages **1350-1**, **1350-2**, and **1350-3**.

The section **1330** may provide a message composition area, where the operator **1302** may input a touch gesture control directive to input text for a message. The touch gesture control directive may, for example, bring up a touch-sensitive keyboard display for text entry, or may activate a microphone for speech-to-text entry, or may accept input from a stylus and perform optical character recognition on handwriting from the stylus.

As shown, the messages **1350-1** and **1350-2** are conventional text messages. Messages may also include, for example, and without limitation, audio messages, images, video clips, links to web pages, and so forth. The message **1350-3** includes an animated sticker, sent by Anne to the device **1310**. The message **1350-3** may be displayed with an indication that the message is not static, for example, with a "play" UI element. When operated on by the operator **1302**, the animated message may be played within the section **1320**.

FIG. **14** illustrates a centralized system **1400**. The centralized system **1400** may implement some or all of the structure and/or operations for the system **100** for securing delivery of an animated message in a single computing entity, such as entirely within a single device **1420**.

The device **1420** may comprise any electronic device capable of receiving, processing, and sending information, and may be an embodiment of a mobile device, e.g. mobile device **110** or **200**. Examples of an electronic device may include without limitation an ultra-mobile device, a mobile device, a personal digital assistant (PDA), a mobile computing device, a smart phone, a telephone, a digital telephone, a cellular telephone, eBook readers, a handset, a one-way pager, a two-way pager, a messaging device, a computer, a personal computer (PC), a desktop computer, a laptop computer, a notebook computer, a netbook computer, a handheld computer, a tablet computer, a server, a server array or server farm, a web server, a network server, an Internet server, a work station, a mini-computer, a main frame computer, a supercomputer, a network appliance, a web appliance, a distributed computing system, multiprocessor systems, processor-based systems, consumer electronics, programmable consumer electronics, game devices, television, digital television, set top box, wireless access point, base station, subscriber station, mobile subscriber center, radio network controller, router, hub, gateway, bridge, switch, machine, or combination thereof. The embodiments are not limited in this context.

The device **1420** may execute processing operations or logic for the system **100** using a processing component **1430**. The processing component **1430** may comprise various hardware elements, software elements, or a combination of both. Examples of hardware elements may include devices, logic devices, components, processors, microprocessors, circuits, processor circuits, circuit elements (e.g., transistors, resistors, capacitors, inductors, and so forth), integrated circuits, application specific integrated circuits (ASIC), programmable logic devices (PLD), digital signal processors (DSP), field programmable gate array (FPGA), memory units, logic gates, registers, semiconductor device, chips, microchips, chip sets, and so forth. Examples of software elements may include software components, programs, applications, computer programs, application programs, system programs, software development programs, machine programs, operating system software, middleware, firmware, software modules, routines, subroutines, functions, methods, procedures, software interfaces, application program interfaces (API), instruction sets, computing code, computer code, code segments, computer code segments, words, values, symbols, or any combination thereof. Determining whether an embodiment is implemented using hardware elements and/or software elements may vary in accordance with any number of factors, such as desired computational rate, power levels, heat tolerances, processing cycle budget, input data rates, output data rates, memory resources, data bus speeds and other design or performance constraints, as desired for a given implementation.

The device **1420** may execute communications operations or logic for the system **100** using communications component **1440**. The communications component **1440** may implement any well-known communications techniques and protocols, such as techniques suitable for use with packet-switched networks (e.g., public networks such as the Internet, private networks such as an enterprise intranet, and so forth), circuit-switched networks (e.g., the public switched telephone network), or a combination of packet-switched networks and circuit-switched networks (with suitable gateways and translators). The communications component **1440** may include various types of standard communication elements, such as one or more communications interfaces, network interfaces, network interface cards (NIC), radios, wireless transmitters/receivers (transceivers), wired and/or wireless communication media, physical connectors, and so forth. By way of example, and not limitation, communication media **1412** include wired communications media and wireless communications media. Examples of wired communications media may include a wire, cable, metal leads, printed circuit boards (PCB), backplanes, switch fabrics, semiconductor material, twisted-pair wire, co-axial cable, fiber optics, a propagated signal, and so forth. Examples of wireless communications media may include acoustic, radio-frequency (RF) spectrum, infrared and other wireless media.

The device **1420** may communicate with other devices **1450** over a communications media **1442** using communications signals **1444** via the communications component **1440**. The devices **1450** may be internal or external to the device **1420** as desired for a given implementation.

The device **1420** may include within it the animation application component **250**. The device **1420** may include within it various input components **1412**, which may include keyboards, touch-sensitive interfaces, microphones, cameras, and the like, for example, as shown in FIG. **2**. The device **1420** may include within it various output components **1414**, which may include speakers, displays, and the like, for example as shown in FIG. **2**. Device **1420** may be operative to carry out the tasks of these elements using processing component **1430** and communications component **1440**. Devices **1450** may comprise any of devices **110** or **150**, the signals **1414** over media **1412** comprising the interactions between the device **1420** and its elements and these respective devices.

FIG. **15** illustrates an embodiment of a distributed system **1500**. The distributed system **1500** may distribute portions of the structure and/or operations for the system **100** across multiple computing entities. Examples of distributed system **1500** may include without limitation a client-server architecture, a 3-tier architecture, an N-tier architecture, a tightly-coupled or clustered architecture, a peer-to-peer architecture, a master-slave architecture, a shared database architecture, and other types of distributed systems. The embodiments are not limited in this context.

The distributed system **1500** may comprise a message server device **1520**. In general, the message server device **1520** may be similar to the device **1420** as described with reference to FIG. **14**. For instance, the message server device **1520** may comprise, a processing component **1530** and a communications component **1540**, which are the same or similar to the processing component **1430** and the communications component **1440**, respectively, as described with reference to FIG. **14**. In another example, the message server device **1520** may communicate over a communications media **1512** using communications signals **1514** via the communications components **1540**.

The message server device **1520** may comprise or employ one or more server programs that operate to perform various methodologies in accordance with the described embodiments. For example, message server device **1520** may implement the message server component **224**, as well as some or all of the components of the animation application component **350**. It will be appreciated the server device **1520**—or any of the server devices discussed herein—may itself comprise multiple servers.

Included herein is a set of flow charts representative of exemplary methodologies for performing novel aspects of the disclosed architecture. While, for purposes of simplicity of explanation, the one or more methodologies shown herein, for example, in the form of a flow chart or flow diagram, are shown and described as a series of acts, it is to be understood and appreciated that the methodologies are not limited by the order of acts, as some acts may, in accordance therewith, occur in a different order and/or concurrently with other acts from that shown and described herein. For example, those skilled in the art will understand and appreciate that a methodology could alternatively be represented as a series of interrelated states or events, such as in a state diagram. Moreover, not all acts illustrated in a methodology may be required for a novel implementation.

FIG. **16** illustrates an embodiment of a logic flow **1600** for the system **100**. The logic flow **1600** may be representative of some or all of the operations executed by one or more embodiments described herein. The operations of the logic flow **1600** may be performed by an animation application component **250** on a mobile device **110**.

In the illustrated embodiment shown in FIG. **16**, the logic flow **1600** may be operative at block **1602** to receive a first control directive selecting an image to animate. For example, the GUI generator **332** may present one or more images that represent sticker sets on a display component, and may receive a selection by the operator via a control directive. When the animation frames of the selected image are not in the local storage, the animation application component may retrieve the set of animation frames from a remote storage, e.g. from the server **220**.

The logic flow **1600** may be operative at block **1604** to receive a second control directive to start recording audio input. For example, the GUI generator **332** may present a UI element that, when operated on with a control directive, directs the microphone to receive audio input, and the sticker recorder **334** to record the audio input. In some embodiments, the first and second control directives may be combined into a single control directive that both selects an image and starts receiving and recording audio input.

The logic flow **1600** may be operative at block **1606** to receive audio input, responsive to the second control directive. For example, the sticker recorder **334** may receive audio input from the microphone. The energy analyzer **336** may also receive the audio input, either directly from the microphone or from the sticker recorder **334**. In some embodiments, the audio input may be received from an audio data file, e.g. from previously recorded audio input.

The logic flow **1600** may be operative at block **1608** to animate the selected image according to an energy level of the received audio input. For example, the sticker animator **338** selects animation frames in the selected sticker set to output based on the energy level of the received audio input. The animation frames in the sticker set may be mapped to sub-ranges of a range of measured energy levels, such that an measured energy level in one sub-range will cause the animation frame mapped to that sub-range to be output. The sequence of animation frames may be stored, along with the received audio input, as an animated sticker, which may be played on demand at later times. An embodiment of the block **1608** is described with respect to FIG. **17**.

The logic flow **1600** may be operative at block **1610** to present the animated image on a display. The block **1610** may occur simultaneously with the block **1608** by presenting the selected animation frames in the sequence. The animated image may appear, to the human observer, to be animated according to the audio input as the audio input is received. For example, if the selected sticker set includes a representation of a face, with animation frames showing different sized mouth openings, the animated image may appear to open the mouth to different sizes according to how loudly the speaker or source of audio input is currently speaking.

The logic flow **1600** may be operative at block **1612** to determine whether a control directive has been received to stop receiving audio input. When no such control directive has been received, the logic flow **1600** may return to the block **1606**.

The logic flow **1600** may be operative at block **1614** to present post-animation options, when the control directive to stop receiving audio input is received. For example, the options may include saving the animated sticker, deleting the animated sticker, sending the animated sticker as a message, and/or applying after-effects to the animated sticker.

FIG. **17** illustrates an embodiment of a logic flow **1700** for the system **100**. The logic flow **1700** may be representative of some or all of the operations executed by one or more embodiments described herein. The operations of the logic flow **1700** may be performed by the mobile device **110** when an audio message is received by the mobile device. In particular, the logic flow **1700** may represent an embodiment of the block **1608** from the logic flow **1600**.

In the illustrated embodiment shown in FIG. **17**, the logic flow **1700** may begin at block **1702**. In block **1702**, the energy level of the current audio input may be measured. For example, the energy analyzer **336** may measure the energy level of audio input at a current time, and may store past measurements. The energy level of the audio input may be measured at periodic intervals, or continuously.

The logic flow **1700** may be operative at block **1704** to determine a range of energy levels of previously received audio input. The range may be determined as the range of energy values between a highest energy level and a lowest energy level in the selected previously received audio input. The energy analyzer **336** may, for example, determine the range from the previous one second's worth of energy level measurements, or from the last quarter of a second. The energy analyzer **336** may normalize the determined range, in order to make the high and low values consistent over the time of the animation.

The logic flow **1700** may be operative at block **1706** to divide the range into a plurality of sub-ranges. Determining the range of energy levels may also include dividing the range into two or more sub-ranges. The number of sub-ranges may match the number of animation frames in the selected sticker set. When the determined range is normalized, the sub-ranges may be created once for the animation. When the determined range is not normalized, the range may need to be re-determined at periodic intervals, and the sub-ranges may need to be re-determined as well.

The logic flow **1700** may be operative at block **1708** to map each animation frame to a different sub-range. For example, a sticker set comprising a plurality of animation frames may arrange the animation frame in an ordering that reflects a range of possible energy levels. For example, the lowest energy animation frame may be first in the ordering, followed by the animation frames for successively higher energy levels. The sticker animator **338** may map each animation frame in the ordering to the sub-ranges in the same ordering of lowest to highest energy levels.

The logic flow **1700** may be operative at block **1710** to determine which sub-range corresponds to the energy level of the present audio input. For example, the energy analyzer **336** or the sticker animator **338** may select the sub-range having high and low energy levels values that include the energy level of the present audio input.

The logic flow **1700** may be operative at block **1712** to select an animation frame that is mapped to the determined sub-range.

The logic flow **1700** may be operative at block **1714** to present the selected animation frame on a display. For example, the sticker animator **338** may provide the selected animation frame, or an identifier of the selected animation frame to the GUI generator **332** to present on the display component. On successive iterations of the logic flow **1700**, the presentation of the selected animation frame replaces a previously presented animation frame at a frame rate that creates the effect of a moving picture.

The logic flow **1700** may be operative at block **1716** to determine whether the control directive to stop receiving audio input has been received. When no such control directive has been received, the logic flow **1700** may continue to the block **1720**.

When the control directive to stop receiving audio input is received, the logic flow **1700** ends at block **1718**. The result of the operations of the logic flow **1700** is an animated image, also referred to as an animated sticker, that comprises a sequence of animation frames and the audio input. When presented at a particular frame rate, the sequence of animation frames appears to be animated according to the audio input. The animated image may be stored as a single data file, or may be stored in separate files that can be used to generate the animation.

The logic flow **1700** may be operative at block **1720** to get the next present audio input, when the control directive to stop receiving audio input has not been received. The logic flow **1700** then repeats starting at block **1702**. In embodiments where the range of energy levels is normalized, blocks **1704**, **1706**, and **1708** may be skipped on subsequent iterations. In such an embodiment, the block **1702** may further include normalizing the measured energy level of the present audio input according to the same normalization used to determine the range.

FIG. **18** illustrates an embodiment of an exemplary computing architecture **1800** suitable for implementing various embodiments as previously described. In one embodiment, the computing architecture **1800** may comprise or be implemented as part of an electronic device. Examples of an electronic device may include those described with reference to FIGS. **14-15**, among others. The embodiments are not limited in this context.

As used in this application, the terms "system" and "component" are intended to refer to a computer-related entity, either hardware, a combination of hardware and software, software, or software in execution, examples of which are provided by the exemplary computing architecture **1800**. For example, a component can be, but is not limited to being, a process running on a processor, a processor, a hard disk drive, multiple storage drives (of optical and/or magnetic storage medium), an object, an executable, a thread of execution, a program, and/or a computer. By way of illustration, both an application running on a server and the server can be a component. One or more components can reside within a process and/or thread of execution, and a component can be localized on one computer and/or distributed between two or more computers. Further, components may be communicatively coupled to each other by various types of communications media to coordinate operations. The coordination may involve the uni-directional or bi-directional exchange of information. For instance, the components may communicate information in the form of signals communicated over the communications media. The information can be implemented as signals allocated to various signal lines. In such allocations, each message is a signal. Further embodiments, however, may alternatively employ data messages. Such data messages may be sent across various connections. Exemplary connections include parallel interfaces, serial interfaces, and bus interfaces.

The computing architecture **1800** includes various common computing elements, such as one or more processors, multi-core processors, co-processors, memory units, chipsets, controllers, peripherals, interfaces, oscillators, timing devices, video cards, audio cards, multimedia input/output (I/O) components, power supplies, and so forth. The embodiments, however, are not limited to implementation by the computing architecture **1800**.

As shown in FIG. **18**, the computing architecture **1800** comprises a processing circuit **1804**, a system memory **1806** and a system bus **1808**. The processing circuit **1804** can be any of various commercially available processors, including without limitation an AMD® Athlon®, Duron® and Opteron® processors; ARM® application, embedded and secure processors; IBM® and Motorola® DragonBall® and PowerPC® processors; IBM and Sony® Cell processors; Intel® Celeron®, Core (2) Duo®, Itanium®, Pentium®, Xeon®, and XScale® processors; and similar processors. Dual microprocessors, multi-core processors, and other multi-processor architectures may also be employed as the processing circuit **1804**.

The system bus **1808** provides an interface for system components including, but not limited to, the system memory **1806** to the processing circuit **1804**. The system bus **1808** can be any of several types of bus structure that may further interconnect to a memory bus (with or without a memory controller), a peripheral bus, and a local bus using any of a variety of commercially available bus architectures. Interface adapters may connect to the system bus **1808** via a slot architecture. Example slot architectures may include without limitation Accelerated Graphics Port (AGP), Card Bus, (Extended) Industry Standard Architecture ((E)ISA), Micro Channel Architecture (MCA), NuBus, Peripheral Component Interconnect (Extended) (PCI(X)), PCI Express, Personal Computer Memory Card International Association (PCMCIA), and the like.

The computing architecture **1800** may comprise or implement various articles of manufacture. An article of manufacture may comprise a computer-readable storage medium to store logic. Examples of a computer-readable storage medium may include any tangible media capable of storing electronic data, including volatile memory or non-volatile memory, removable or non-removable memory, erasable or non-erasable memory, writeable or re-writeable memory, and so forth. Examples of logic may include executable computer program instructions implemented using any suitable type of code, such as source code, compiled code, interpreted code, executable code, static code, dynamic code, object-oriented code, visual code, and the like. Embodiments may also be at least partly implemented as instructions contained in or on a non-transitory computer-readable medium, which may be read and executed by one or more processors to enable performance of the operations described herein.

The system memory **1806** may include various types of computer-readable storage media in the form of one or more higher speed memory units, such as read-only memory (ROM), random-access memory (RAM), dynamic RAM (DRAM), Double-Data-Rate DRAM (DDRAM), synchronous DRAM (SDRAM), static RAM (SRAM), programmable ROM (PROM), erasable programmable ROM (EPROM), electrically erasable programmable ROM (EEPROM), flash memory, polymer memory such as ferroelectric polymer memory, ovonic memory, phase change or ferroelectric memory, silicon-oxide-nitride-oxide-silicon (SONOS) memory, magnetic or optical cards, an array of devices such as Redundant Array of Independent Disks (RAID) drives, solid state memory devices (e.g., USB memory, solid state drives (SSD) and any other type of storage media suitable for storing information. In the illustrated embodiment shown in FIG. **18**, the system memory **1806** can include non-volatile memory **1810** and/or volatile memory **1812**. A basic input/output system (BIOS) can be stored in the non-volatile memory **1810**.

The computer **1802** may include various types of computer-readable storage media in the form of one or more lower speed memory units, including an internal (or external) hard disk drive (HDD) **1814-1** and **1814-2**, respectively, a magnetic floppy disk drive (FDD) **1816** to read from or write to a removable magnetic disk **1818**, and an optical disk drive **1820** to read from or write to a removable optical disk **1822** (e.g., a CD-ROM or DVD). The HDD **1814**, FDD **1816** and optical disk drive **1820** can be connected to the system bus **1808** by a HDD interface **1824**, an FDD interface **1826** and an optical drive interface **1828**, respectively. The HDD interface **1824** for external drive implementations can include at least one or both of Universal Serial Bus (USB) and IEEE 1394 interface technologies.

The drives and associated computer-readable media provide volatile and/or nonvolatile storage of data, data structures, computer-executable instructions, and so forth. For example, a number of program modules can be stored in the drives and memory units **1810**, **1812**, including an operating system **1830**, one or more application programs **1832**, other program modules **1834**, and program data **1836**. In one embodiment, the one or more application programs **1832**, other program modules **1834**, and program data **1836** can include, for example, the various applications and/or components of the message application component **230**, the animation application component **250**, **350**; and the message server component **224**.

An operator can enter commands and information into the computer **1802** through one or more wire/wireless input devices, for example, a keyboard **1838** and a pointing device, such as a mouse **1840**. Other input devices may include microphones, infra-red (IR) remote controls, radio-frequency (RF) remote controls, game pads, stylus pens, card readers, dongles, fingerprint readers, gloves, graphics tablets, joysticks, keyboards, retina readers, touch screens (e.g., capacitive, resistive, etc.), trackballs, trackpads, sensors, styluses, and the like. These and other input devices are often connected to the processing circuit **1804** through an input device interface **1842** that is coupled to the system bus **1808**, but can be connected by other interfaces such as a parallel port, IEEE 1394 serial port, a game port, a USB port, an IR interface, and so forth.

A monitor **1844** or other type of display device is also connected to the system bus **1808** via an interface, such as a video adaptor **1846**. The monitor **1844** may be internal or external to the computer **1802**. In addition to the monitor **1844**, a computer typically includes other peripheral output devices, such as speakers, printers, and so forth.

The computer **1802** may operate in a networked environment using logical connections via wired and/or wireless communications to one or more remote computers, such as a remote computer **1848**. The remote computer **1848** can be a workstation, a server computer, a router, a personal computer, a portable computer, a microprocessor-based entertainment appliance, a peer device or other common network node, and typically includes many or all of the elements described relative to the computer **1802**, although, for purposes of brevity, only a memory/storage device **1850** is illustrated. The logical connections depicted include wired/wireless connectivity to a local area network (LAN) **1852** and/or larger networks, for example, a wide area network (WAN) **1854**. Such LAN and WAN networking environments are commonplace in offices and companies, and facilitate enterprise-wide computer networks, such as intranets, all of which may connect to a global communications network, for example, the Internet.

When used in a LAN networking environment, the computer **1802** is connected to the LAN **1852** through a wired and/or wireless communication network interface or adaptor **1856**. The adaptor **1856** can facilitate wired and/or wireless communications to the LAN **1852**, which may also include a wireless access point disposed thereon for communicating with the wireless functionality of the adaptor **1856**.

When used in a WAN networking environment, the computer **1802** can include a modem **1858**, or is connected to a communications server on the WAN **1854**, or has other means for establishing communications over the WAN **1854**, such as by way of the Internet. The modem **1858**, which can be internal or external and a wired and/or wireless device, connects to the system bus **1808** via the input device interface **1842**. In a networked environment, program modules depicted relative to the computer **1802**, or portions thereof, can be stored in the remote memory/storage device **1850**. It will be appreciated that the network connections shown are exemplary and other means of establishing a communications link between the computers can be used.

The computer **1802** is operable to communicate with wire and wireless devices or entities using the IEEE 802 family of standards, such as wireless devices operatively disposed in wireless communication (e.g., IEEE 802.21 over-the-air modulation techniques). This includes at least Wi-Fi (or Wireless Fidelity), WiMax, and Bluetooth™ wireless technologies, among others. Thus, the communication can be a predefined structure as with a conventional network or simply an ad hoc communication between at least two devices. Wi-Fi networks use radio technologies called IEEE 802.21x (a, b, g, n, etc.) to provide secure, reliable, fast wireless connectivity. A Wi-Fi network can be used to connect computers to each other, to the Internet, and to wire networks (which use IEEE 802.3-related media and functions).

FIG. **19** illustrates a block diagram of an exemplary architecture **1900** suitable for implementing various embodiments as previously described. The communications architecture **1900** includes various common communications elements, such as a transmitter, receiver, transceiver, radio, network interface, baseband processor, antenna, amplifiers, filters, power supplies, and so forth. The embodiments, however, are not limited to this implementation by the communications architecture **1900**.

As shown in FIG. **19**, the communications architecture **1900** comprises one or more clients **1902** and servers **1904**. The clients **1902** may implement the devices **1420**. The servers **1904** may implement the server devices **1520**. The clients **1902** and the servers **1904** are operatively connected to one or more respective client data stores **1908** and server data stores **1910** that can be employed to store information local to the respective clients **1902** and servers **1904**, such as cookies and/or associated contextual information.

The clients **1902** and the servers **1904** may communicate information among each other using a communication framework **1906**. The communications framework **1906** may implement any well-known communications techniques and protocols. The communications framework **1906** may be implemented as a packet-switched network (e.g., public networks such as the Internet, private networks such as an enterprise intranet, and so forth), a circuit-switched network (e.g., the public switched telephone network), or a combination of a packet-switched network and a circuit-switched network (with suitable gateways and translators).

The communications framework **1906** may implement various network interfaces arranged to accept, communicate, and connect to a communications network. A network interface may be regarded as a specialized form of an input output interface. Network interfaces may employ connection protocols including without limitation direct connect, Ethernet (e.g., thick, thin, twisted pair 10/100/1000 Base T, and the like), token ring, wireless network interfaces, cellular network interfaces, IEEE 802.11a-x network interfaces, IEEE 802.16 network interfaces, IEEE 802.20 network interfaces, and the like. Further, multiple network interfaces may be used to engage with various communications network types. For example, multiple network interfaces may be employed to allow for the communication over broadcast, multicast, and unicast networks. Should processing requirements dictate a greater amount speed and capacity, distributed network controller architectures may similarly be employed to pool, load balance, and otherwise increase the communicative bandwidth required by clients **1902** and the servers **1904**. A communications network may be any one and the combination of wired and/or wireless networks including without limitation a direct interconnection, a secured custom connection, a private network (e.g., an enterprise intranet), a public network (e.g., the Internet), a Personal Area Network (PAN), a Local Area Network (LAN), a Metropolitan Area Network (MAN), an Operating Missions as Nodes on the Internet (OMNI), a Wide Area Network (WAN), a wireless network, a cellular network, and other communications networks.

FIG. **20** illustrates an embodiment of a device **2000** for use in a multicarrier OFDM system, such as the animated messaging system **100**. Device **2000** may implement, for example, software components **2060** as described with reference to mobile device **200** and/or a logic circuit **2030**. The logic circuit **2030** may include physical circuits to perform operations described for the mobile device **200**. As shown in FIG. **20**, device **2000** may include a radio interface **2010**, baseband circuitry **2020**, and computing platform **2050**, although embodiments are not limited to this configuration.

The device **2000** may implement some or all of the structure and/or operations for the mobile device **200** and/or logic circuit **2030** in a single computing entity, such as entirely within a single device. Alternatively, the device **2000** may distribute portions of the structure and/or operations for the mobile device **200** and/or logic circuit **2030** across multiple computing entities using a distributed system architecture, such as a client-server architecture, a 3-tier architecture, an N-tier architecture, a tightly-coupled or clustered architecture, a peer-to-peer architecture, a master-slave architecture, a shared database architecture, and other types of distributed systems. The embodiments are not limited in this context.

In one embodiment, radio interface **2010** may include a component or combination of components adapted for transmitting and/or receiving single carrier or multi-carrier modulated signals (e.g., including complementary code keying (CCK) and/or orthogonal frequency division multiplexing (OFDM) symbols) although the embodiments are not limited to any specific over-the-air interface or modulation scheme. Radio interface **2010** may include, for example, a receiver **2012**, a transmitter **2016** and/or a frequency synthesizer **2014**. Radio interface **2010** may include bias controls, a crystal oscillator and/or one or more antennas **2018**. In another embodiment, radio interface **2010** may use external voltage-controlled oscillators (VCOs), surface acoustic wave filters, intermediate frequency (IF) filters and/or RF filters, as desired. Due to the variety of potential RF interface designs an expansive description thereof is omitted.

Baseband circuitry **2020** may communicate with radio interface **2010** to process, receive and/or transmit signals and may include, for example, an analog-to-digital converter **2022** for down converting received signals, a digital-to-analog converter **2024** for up converting signals for transmission. Further, baseband circuitry **2020** may include a baseband or physical layer (PHY) processing circuit **2026** for PHY link layer processing of respective receive/transmit signals. Baseband circuitry **2020** may include, for example, a processing circuit **2028** for medium access control (MAC)/data link layer processing. Baseband circuitry **2020** may include a memory controller **2032** for communicating with processing circuit **2028** and/or a computing platform **2050**, for example, via one or more interfaces **2034**.

In some embodiments, PHY processing circuit **2026** may include a frame construction and/or detection module, in combination with additional circuitry such as a buffer memory, to construct and/or deconstruct communication frames, such as radio frames. Alternatively or in addition, MAC processing circuit **2028** may share processing for certain of these functions or perform these processes independent of PHY processing circuit **2026**. In some embodiments, MAC and PHY processing may be integrated into a single circuit.

The computing platform **2050** may provide computing functionality for the device **2000**. As shown, the computing platform **2050** may include a processing component **2040**. In addition to, or alternatively, the baseband circuitry **2020**, the device **2000** may execute processing operations or logic for the mobile device **200** and logic circuit **2030** using the processing component **2040**. The processing component **2040** (and/or PHY **2026** and/or MAC **2028**) may comprise various hardware elements, software elements, or a combination of both. Examples of hardware elements may include devices, logic devices, components, processors, microprocessors, circuits, processor circuits, circuit elements (e.g., transistors, resistors, capacitors, inductors, and so forth), integrated circuits, application specific integrated circuits (ASIC), programmable logic devices (PLD), digital signal processors (DSP), field programmable gate array (FPGA), memory units, logic gates, registers, semiconductor device, chips, microchips, chip sets, and so forth. Examples of software elements may include software components, programs, applications, computer programs, application programs, system programs, software development programs, machine programs, operating system software, middleware, firmware, software modules, routines, subroutines, functions, methods, procedures, software interfaces, application program interfaces (API), instruction sets, computing code, computer code, code segments, computer code segments, words, values, symbols, or any combination thereof. Determining whether an embodiment is implemented using hardware elements and/or software elements may vary in accordance with any number of factors, such as desired computational rate, power levels, heat tolerances, processing cycle budget, input data rates, output data rates, memory resources, data bus speeds and other design or performance constraints, as desired for a given implementation.

The computing platform **2050** may further include other platform components **2062**. Other platform components **2062** include common computing elements, such as one or more processors, multi-core processors, co-processors, memory units, chipsets, controllers, peripherals, interfaces, oscillators, timing devices, video cards, audio cards, multimedia input/output (I/O) components (e.g., digital displays), power supplies, and so forth.

The computing platform **2050** and the baseband circuitry **2020** may further include one or memory units in the form of storage medium **2070**. Examples of memory units may include, without limitation. various types of computer readable and machine readable storage media in the form of one or more higher speed memory units, such as read-only memory (ROM), random-access memory (RAM), dynamic RAM (DRAM), Double-Data-Rate DRAM (DDRAM), synchronous DRAM (SDRAM), static RAM (SRAM), programmable ROM (PROM), erasable programmable ROM (EPROM), electrically erasable programmable ROM (EEPROM), flash memory, polymer memory such as ferroelectric polymer memory, ovonic memory, phase change or ferroelectric memory, silicon-oxide-nitride-oxide-silicon (SONOS) memory, magnetic or optical cards, an array of devices such as Redundant Array of Independent Disks (RAID) drives, solid state memory devices (e.g., USB memory, solid state drives (SSD) and any other type of storage media suitable for storing information.

Device **2000** may be, for example, an ultra-mobile device, a mobile device, a fixed device, a machine-to-machine (M2M) device, a personal digital assistant (PDA), a mobile computing device, a smart phone, a telephone, a digital telephone, a cellular telephone, user equipment, eBook readers, a handset, a one-way pager, a two-way pager, a messaging device, a computer, a personal computer (PC), a desktop computer, a laptop computer, a notebook computer, a netbook computer, a handheld computer, a tablet computer, a server, a server array or server farm, a web server, a network server, an Internet server, a work station, a mini-computer, a main frame computer, a supercomputer, a network appliance, a web appliance, a distributed computing system, multiprocessor systems, processor-based systems, consumer electronics, programmable consumer electronics, game devices, television, digital television, set top box, wireless access point, base station, node B, evolved node B (eNB), subscriber station, mobile subscriber center, radio network controller, router, hub, gateway, bridge, switch, machine, or combination thereof. Accordingly, functions and/or specific configurations of device **2000** described herein, may be included or omitted in various embodiments of device **2000**, as suitably desired. In some embodiments, device **2000** may be configured to be compatible with protocols and frequencies associated one or more of the 3GPP LTE Specifications and/or IEEE 802.16 standards for WMANs, and/or other broadband wireless networks, cited herein, although the embodiments are not limited in this respect.

Embodiments of device **2000** may be implemented using single input single output (SISO) architectures. However, certain implementations may include multiple antennas (e.g., antennas **2018**) for transmission and/or reception using adaptive antenna techniques for beamforming or spatial division multiple access (SDMA) and/or using MIMO communication techniques.

The components and features of device **2000** may be implemented using any combination of discrete circuitry, application specific integrated circuits (ASICs), logic gates and/or single chip architectures. Further, the features of device **2000** may be implemented using microcontrollers, programmable logic arrays and/or microprocessors or any combination of the foregoing where suitably appropriate. It is noted that hardware, firmware and/or software elements may be collectively or individually referred to herein as "logic" or "circuit."

It should be appreciated that the exemplary device **2000** shown in the block diagram of FIG. **20** may represent one functionally descriptive example of many potential implementations. Accordingly, division, omission or inclusion of block functions depicted in the accompanying figures does not infer that the hardware components, circuits, software and/or elements for implementing these functions would be necessarily be divided, omitted, or included in embodiments.

Accordingly, embodiments include methods, apparatuses, and computer-readable storage media for communicating using audio messages. For example, a method may include receiving a first control directive to select an image representing a set of animation frames in a user interface view of an application executing on a first mobile device; receiving a second control directive to begin receiving audio input in the user interface view; receiving audio input by the first mobile device; animating the image according to an energy level of the audio input using the animation frames; and presenting the animated image concurrently with receiving the audio input.

A computer-implemented method may further comprise animating the image by: measuring an energy level of the audio input, and at periodic intervals: determining a range of energy levels of previously received audio input over a period from a first past time to a present time; dividing the range of energy levels into a plurality of sub-ranges; mapping each animation frame in the set of animation frames to a different one of the sub-ranges; determining which sub-range corresponds to the measured energy level of a present audio input; selecting an animation frame in the set of animation frames that is mapped to the determined sub-range; and presenting the selected animation frame on a display of the first computing device and outputting the present audio input.

A computer-implemented method may further comprise normalizing the measurements of energy levels to a range comprising a first value and a second value. The number of sub-ranges matches a number of animation frames in the set of animation frames. The animated image comprises a sequence of each animation frame selected, in the order of the selection, and the received audio input.

The application may be a messaging application or a social networking application.

A computer-implemented method may further comprise retrieving the set of animation frames from a remote storage in response to the first control directive.

A computer-implemented method may further comprise receiving a third control directive to stop receiving the audio input; and storing the animated image on a local storage device.

A computer-implemented method may further comprise presenting the selected image in the user interface view with: a first selectable user interface element to play the animated image on the display; a second selectable user interface element to send the animated image as a message; a third selectable user interface element to delete the animated image; or a fourth selectable user interface element to store the animated image on a local storage device.

A computer-implemented method may further comprise sending the animated image as a message to a remote computing device.

A computer-implemented method may further comprise applying an audio effect to the animated image.

A computer-implemented method may further comprise receiving the audio input from a microphone on the first mobile device.

An apparatus may include a processor circuit; an animation application component for execution on the processor circuit, the animation application component comprising: a graphical user interface (GUI) generator to generate user interface views on the display having images representing a set of animation frames, to receive a first control directive to select an image, to receive a second control directive to begin recording audio input, and to present an animated image; a sticker recorder to receive audio input in response to the second control directive; and a sticker animator to animate the selected image according to an energy level of the audio input using the animation frames concurrently with the receiving of the audio input. The apparatus may be operative to implement any of the computer-implemented methods described herein.

The animation application component may comprise: an energy analyzer to measure an energy level of the audio input, and at periodic intervals, to: determine a range of energy levels of previously received audio input over a period from a first past time to a present time, divide the range of energy levels into a plurality of sub-ranges, and determine which sub-range corresponds to the measured energy level of a present audio input; the sticker animator, at each interval, to map each animation frame in the set of animation frames to a different one of the sub-ranges, to select an animation frame in the set of animation frames that is mapped to the determined sub-range, and the GUI generator to present, at each interval, the animated image as a sequence of selected animation frames concurrently with output of the present audio input.

At least one computer-readable storage medium may comprise instructions that, when executed, cause a system to perform any of the computer-implemented methods described herein.

Some embodiments may be described using the expression "one embodiment" or "an embodiment" along with their derivatives. These terms mean that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment. The appearances of the phrase "in one embodiment" in various places in the specification are not necessarily all referring to the same embodiment. Further, some embodiments may be described using the expression "coupled" and "connected" along with their derivatives. These terms are not necessarily intended as synonyms for each other. For example, some embodiments may be described using the terms "connected" and/or "coupled" to indicate that two or more elements are in direct physical or electrical contact with each other. The term "coupled," however, may also mean that two or more elements are not in direct contact with each other, but yet still co-operate or interact with each other.

It is emphasized that the Abstract of the Disclosure is provided to allow a reader to quickly ascertain the nature of the technical disclosure. It is submitted with the understanding that it will not be used to interpret or limit the scope or meaning of the claims. In addition, in the foregoing Detailed Description, it can be seen that various features are grouped together in a single embodiment for the purpose of streamlining the disclosure. This method of disclosure is not to be interpreted as reflecting an intention that the claimed embodiments require more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive subject matter lies in less than all features of a single disclosed embodiment. Thus the following claims are hereby incorporated into the Detailed Description, with each claim standing on its own as a separate embodiment. In the appended claims, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising" and "wherein," respectively. Moreover, the terms "first," "second," "third," and so forth, are used merely as labels, and are not intended to impose numerical requirements on their objects.

What has been described above includes examples of the disclosed architecture. It is, of course, not possible to describe every conceivable combination of components and/or methodologies, but one of ordinary skill in the art may recognize that many further combinations and permutations are possible. Accordingly, the novel architecture is intended to embrace all such alterations, modifications and variations that fall within the spirit and scope of the appended claims.

The invention claimed is:

1. A computer-implemented method, comprising:

receiving a selection of an animated image at a first device, the animated image comprising a number of animation frames;

receiving audio input by a first device;

at periodical intervals during receipt of the audio input:

determining a volume range exhibited in received portions of the audio input;

determining a number of loudness tiers in the audio input by dividing the determined volume range by the number of animation frames in the animated image;

mapping each animation frame in the animated image to a different one of the loudness tiers;

assigning a selected animation frame from animated image to a most recently received portion of the audio input based on the loudness tier corresponding to the most recently received portion; and

presenting the selected animation frame as part of a real-time animation on a user interface view of an application executing on the first device.

2. The method of claim **1**, wherein determining the volume range comprises:

measuring an energy level of the most recently received portion of the audio input; and

determining a range of energy levels of previously received portions of the audio input over a period from a first past time to a present time.

3. The method of claim **2**, comprising:

normalizing the measurements of energy levels to a range comprising a first value and a second value.

4. The method of claim **1**, comprising:

retrieving the set of animation frames from a remote storage in response to a first control directive selecting the image.

5. The method of claim **1**, comprising:

presenting the selected image in the user interface view with: a first selectable user interface element to play the animated image on the display; a second selectable user interface element to send the animated image as a message; a third selectable user interface element to delete the animated image; or a fourth selectable user interface element to store the animated image on a local storage device.

6. The method of claim **1**, comprising:

sending the animated image as a message to a remote computing device.

7. The method of claim **1**, comprising:

applying an audio effect to the animated image.

8. The method of claim **1** wherein the periodic interval corresponds to a frame rate of the animated image.

9. An apparatus, comprising:

a display;

a processor circuit; and

a non-transitory computer-readable medium storing animation application logic, the processor circuit configured to execute the animation application logic to:

generate user interface views on the display having animated images comprising a number of animation frames;

receive a first control directive to select an animated image;

receive a second control directive to begin recording audio input;

receive audio input in response to the second control directive,

at periodical intervals during receipt of the audio input:

determine a volume range exhibited in received portions of the audio input,

determine a number of loudness tiers in the audio input by dividing the determined volume range by the number of the animation frames in the selected animated image,

map each animation frame in the selected animated image to a different one of the loudness tiers;

assign a selected animation frame from the selected animated image to a most recently received portion of the subsequent audio input based on the loudness tier corresponding to the most recently received portion, and

present the selected animation frame as part of a real-time animation on the display.

10. The apparatus of claim **9**, the animation application logic further configured to cause the processor circuit to:

measure an energy level of the most recently received portion of the audio input; and

determine a range of energy levels of previously received portions of the audio input over a period from a first past time to a present time.

11. The apparatus of claim **10**, the processor circuit further configured to normalize the measurements of energy levels between a first value and a second value.

12. The apparatus of claim **9**, the processor circuit further configured to:

present the selected image in the user interface view with:

a first selectable user interface element to play the animated image on the display; a second selectable user interface element to send the animated image as a message; a third selectable user interface element to delete the animated image; or a fourth selectable user interface element to store the animated image on a local storage device.

13. The apparatus of claim **9** were in the periodic interval corresponds to a frame rate of the animated image.

14. At least one computer-readable storage medium comprising instructions for a message application component that, when executed, cause a device to:

receive a selection of an animated image at a first device, the animated image comprising a set of animation frames;

receive audio input;

determine a volume range exhibited in the audio input;

divide the audio input into a number of loudness tiers based on the determined volume range, the number of loudness tiers corresponding to a number of the animation frames in the animated image;

receiving subsequent audio input;

measure an overall volume corresponding to a loudness of the subsequent audio input;

at periodic intervals while the audio input is received:

determine a range of loudnesses of previously received audio input over a period from a first past time to a present time;

divide the range of loudnesses into a plurality of sub-ranges;

determine which sub-range corresponds to the measured overall volume of a present audio input;

determine an animation frame mapped to the determined sub-range; and

present the determined animation frame on a display of the device in real-time as the present audio input is received.

15. The computer-readable storage medium of claim **14**, the animation frame determined from a set of animation frames corresponding to a selected image.

16. The computer-readable storage medium of claim **14**, comprising instructions that when executed, cause the device to:

normalize the measured energy levels to a range comprising a first value and a second value.

17. The computer-readable storage medium of claim **14**, comprising instructions that when executed, cause the device to:

store each determined animation frame in an order of the determination and the received audio input as an animated image in a local storage on the device.

18. The computer-readable storage medium of claim **17**, comprising instructions that when executed, cause the device to:

send the animated image as a message to a remote computing device.

19. The computer-readable storage medium of claim **14**, wherein the periodic interval is a fraction of one second.

20. The computer-readable storage medium of claim **14**, wherein a duration between the first past time to the present time is different from the periodic interval.

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